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THE REVIEW
OF
APPLIED MYCOLOGY

Compiled from
WORLD LITERATURE ON PLANT PATHOLOGY
AND APPLIED MYCOLOGY

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McKEEN (C. D.). **Trichothecium foliage rot of greenhouse Cucumbers.**—*Canad. J. agric. Sci.*, 34, 5, pp. 469–472, 1 pl., 1954.

Trichothecium roseum is reported to be causing a foliage rot of greenhouse cucumbers [cf. *R.A.M.*, 16, p. 699] in southern Ontario, damage being greatest on tender foliage under high humidity conditions. The fungus grows from decaying organic matter, such as insect excreta and fallen blossoms, on to adjacent healthy leaf tissue. It is suggested that the fungus is introduced into the greenhouse on mulching materials. So far there is no known satisfactory control.

RICE (R. V.), LINDBERG (G. D.), KAESBERG (P.), WALKER (J. C.), & STAHMANN (M. A.). **The three components of Squash mosaic virus.**—*Phytopathology*, 45, 3, pp. 145–148, 1 fig., 1955.

Squash mosaic virus [*R.A.M.*, 31, p. 368] preparations, isolated at the University of Wisconsin from sugar pumpkin or wild cucumber plants by a combination of acid precipitation and differential centrifugation, fell into three components in the ultracentrifuge, whereas only one Schlieren peak was demonstrated by electrophoresis at pH values of 4·75, 6·02, 7·5, and 8·24. The isoelectric point was 4·65 and the sedimentation coefficients, measured in Svedberg units, were 111 S, 88 S, and 56 S. The relative amounts of the components remained constant at 34, 62, and 4 per cent., respectively, in isolates from plants infected from one to eight weeks. The uppermost component (56 S) obtained by means of an ultracentrifuge separation cell proved to be non-pathogenic to National Pickling cucumber plants and appeared from pentose estimations by the Bial method to contain less nucleic acid than the middle and lowest. The last two infected two out of 10 plants at a dilution of 1 in 50, and all 10 at 1 in 3. In freeze-dried electron micrograph preparations containing all three components the most predominant particles appeared as polyhedrons with a diameter of 33 mμ.

HARVEY (J. M.). **Decay in stored Grapes reduced by field applications of fungicides.**—*Phytopathology*, 45, 3, pp. 137–140, 1955.

At the U.S. Horticultural Field Station, Fresno, California, decay in stored Emperor grapes, due mainly to *Botrytis cinerea*, was significantly reduced by several applications in the field of protective fungicides as an adjunct to post-harvest sulphur dioxide fumigation [*R.A.M.*, 30, p. 113 *et passim*]. Captan, used either as a spray at a concentration of 2 lb. 50 per cent. active ingredient per 100 gals. water applied at the rate of 120 gals. per acre, or as a dust (5 per cent. of the active ingredient at 45 lb. per acre), was effective in 1951 and 1953, and in the latter year crag 5400 dust (containing 6 per cent. α,α-trithiobis (*N*-dimethylthio-formamide)) at the rate of 45 lb. per acre also gave satisfactory results. In 1952, when the losses from decay were unimportant, none of the treatments was significantly

beneficial. Grapes dusted with fusarex (tetrachloronitrobenzene) sustained appreciably heavier infection than the untreated. There was no marked change as a result of the treatments in the comparatively small proportion of rotting caused by *Cladosporium herbarum* and by species of *Alternaria* and *Stemphylium*.

Amphoux (M.) & Bernon (G.). **La lutte contre le mildiou.** [The control of mildew.] —*Progr. agric. vitic.*, 141, 14–15, pp. 214–219; 16–17, pp. 227–234; 18–19, pp. 259–262, 1954.

The authors discuss the problem of the control of vine [downy] mildew [*Plasmopara viticola*] under the main headings (1) date of treatments; (2) spray warnings; (3) organization of control; (4) prophylaxis; (5) collective control; and (6) individual control. It is concluded that prophylactic measures should be applied as soon as the leaf buds open and should be continued subsequently. The more prophylactic measures have been neglected or are inadequate, the more important detection becomes, and spray applications should be more frequent and more thoroughly effected once the outbreak has started.

Gartel (W.). **Les effets de la carence en bore sur la Vigne.** [The effects of boron deficiency on the Vine.]—*Progr. agric. vitic.*, 142, 45–46, pp. 273–279, 1954.

The first visible sign of boron deficiency in vines [*R.A.M.*, 33, p. 335] is the presence of weak branches with irregularly shortened internodes, which may give the vine a witches' broom appearance. More characteristic is the death of the extremity of the branches. Dark brown, necrotic areas coalesce to obstruct the woody bundles by the formation of plaques, which are particularly conspicuous at the growing points and on the young tendrils, and can be seen by transmitted light. Longitudinal growth ceases on the injured side, but continues on the other, inciting lacerations. As the first four or five leaves develop, most of the vessels in the growing tips become affected, the translocation of nutrients is interrupted, and die-back follows. Longitudinal growth continues from the nearest internode but succumbs if the boron supply does not increase. This process continues with successive buds and the internodes become shorter and thicker to form a witches' broom.

The growing point of the root thickens and develops rod-shaped malformations. Secondary roots grow above the thickening and are also malformed and thickened, the whole root system assuming a coralloid appearance.

The leaves become thick, leathery, and glossy, and develop a mosaic discoloration and a slight undulation. After a time, the edges roll downwards or, occasionally, upwards, the central part of the leaf continuing to bulge towards the apex. Chlorosis extends between the veins, which, with a narrow border, remain green and become completely obstructed in their upper part. A narrow zone at the edge of the leaf dies, the dead area spreads towards the middle, and finally the whole leaf dies.

The formation of sugars is greatly reduced and their translocation impeded, affected leaves containing up to 100 per cent. more sugar than healthy ones. This accumulation of sugars may commence before any chlorosis or microscopic modification of the leaf is evident. Flower shedding is also an important consequence of vascular breakdown.

News and notes. Changes in national plant quarantine services.—*F.A.O. Pl. Prot. Bull.*, 2, 12, p. 191, 1954.

A new unit, the Division of Plant Control and Quarantine, has been established within the South African Department of Agriculture to administer all regulatory and legislative measures for plant protection previously the responsibility of the Divisions of Entomology and Plant Pathology. Professor S. J. du Plessis was appointed Chief of the new Division in April, 1954.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 2, 12, p. 190, 1954.

Gladiolus corms or cormels may be imported into Australia only by approved importers for growing in post-entry quarantine. Not more than five of any one variety may be introduced by any one importer in any year. Consignments must be accompanied by a certificate issued by a recognized authority in the country of origin, attesting that the material is free from disease, and especially from yellows (*Fusarium oxysporum* var. [f.] *gladioli*) [*R.A.M.*, 33, p. 724] and viruses, such as bean yellow mosaic [33, p. 84], tobacco ring spot [loc. cit.], and cucumber mosaic [loc. cit.]. Upon arrival the corms and cormels are to be treated with an approved disinfectant and planted in isolation.

These restrictions have been imposed because of the very frequent detection of yellows in imported corms and because of the recent discovery in North America that gladiolus may be a reservoir of dangerous viruses, including those mentioned.

Regulations concerning the importation of plants and plant products, etc.—*Bull. Dep. Agric. Trin. Tob.* 5, 24 pp., [? 1953].

It is stated that the plant protection policy of the British West Indies is in general the same as that of the United States. Plants and related agricultural articles are listed, the import of which into the British West Indies is forbidden or restricted. The previous Plant Protection Regulations of 1941 are revoked, and new Regulations of 10th February, 1953, are reprinted in full.

Matthew (K. T.). **A note on the spike diseases of Sandal.**—*Indian For.*, 81, 6, pp. 384–386, 1955.

Further research on the spike disease of sandal (*Santalum album*) [*R.A.M.*, 34, p. 485] in Madras, India, showed that the trees which become infected are usually parasitic on such hosts as *Cajanus indicus*, *Cassia montana*, *Acacia suma*, and *Pongamia glabra*, which render sandal susceptible to the disease. *Ruta graveolens*, on the other hand, is recommended as an intermediate host, while *Cassia siamea* may be used subsequently for establishing young sandal plantations; *Azadirachta indica*, *Murraya koenigii*, *Eugenia jambolana*, *Toddalia aculeata*, and *Dodonea viscosa* are all suitable hosts, rendering sandal fairly resistant to spike.

Fire, dense stands of sandal, rainfall followed by excessive heat, and a dominant host in the vegetation, e.g., *Lantana*, all contribute to predisposing sandal to the disease.

Annual Report (abridged) of the Scottish Society for Research in Plant-Breeding, 1953.—49 pp., 2 pl., 1953.

In the section of this report [cf. *R.A.M.*, 30, p. 99] dealing with research, J. W. Gregor states that selections from *S[olanum] simplicifolium* crossed with an Australian potato variety resistant to virus Y show great promise as virus Y resisters. Many of the selections possess genes conferring resistance to blight (*Phytophthora infestans*) and field immunity from potato virus X [loc. cit.].

The potato registration trials of 1952 contained 14 of the Society's seedlings, of which 13 were field-immune from all the strains of *P. infestans* occurring in Scotland, six were field-immune from potato virus X, and one was resistant to potato virus Y by means of a localized necrotic reaction.

A further selection of strains of potato virus X fell into three groups in respect of their ability to kill varieties carrying the genes Nx or Nb [30, p. 100], either separately or together. Two of the strains caused the gene Nx to exert a lethal effect and gene Nb a necrotic but non-lethal one. U.S. seedling 41956 was immune from all the strains. The data obtained fit in well with the genetical hypothesis that the character is controlled by two complementary dominant genes

which together override the Nx gene, but when separated cause the latter to behave lethally in the presence of certain virus X strains.

In similar studies with potato virus Y in which 12 strains were tested on various potato varieties, nine strains were found to be variants of a single group while the other three were all distinct. Evidence has been obtained from this work that the genetic factors controlling necrotic responses to potato viruses X, A, Y, and C in diploid *Solanum* hybrids and species are contained in a single linkage group.

In tests of various *Brassica* crops for resistance to club root [*Plasmodiophora brassicae*: 32, p. 3] all the material from Asia was highly susceptible. Some resistant swede lines bore numerous small nodules at the base of the side roots, similar to those occurring on the resistant variety Wilhelmsburger [30, p. 100].

Annual Report of the Department of Agriculture, Uganda Protectorate, for the year ended 31st December, 1953.—106 pp., 4 graphs, 1954. [Received March, 1955.]

In the section of this report [cf. *R.A.M.*, 34, p. 82] dealing with Buganda Province (pp. 9–26) D. R. N. Brown states that Panama disease (*Fusarium oxysporum* var. *cubense*) [32, p. 423] of bananas occurred in many places in the Mubende, Masaka, and Mengo districts. During very dry weather in Masaka all the resistant cassava varieties except No. 11,F279 succumbed to some extent to mosaic [virus: 34, p. 83]. North Kyagwe, Bugerere, and south Mawokota are now nearly freed from the disease.

D. F. Stewart reports from the Eastern Province (pp. 26–40) that the annual survey showed the mean percentage of cotton infected with blackarm [*Xanthomonas malvacearum*: 33, p. 82 and below, p. 644] in segregated areas sown with dressed seed for four seasons to be 3·3; in Usuku and Teso (three seasons) 5·1; South Mbale (two) 8·3; North Mbale (one) 15·1; and Busoga (one) 42·5. In Busoga and Mbale, where cassava mosaic had been very prevalent, there was a heavy demand for resistant varieties from distribution centres, resulting in a general improvement. Groundnut rosette disease [loc. cit.] was more prevalent in most areas, probably because of poor stands.

For the Western Province R. P. Davidson (pp. 40–57) states that maize rust (*Puccinia polysora*) [C.M.I. map No. 237] was confirmed from Bwamba but was not at all serious. Tobacco at Kigezi was severely affected by leaf curl [virus: *R.A.M.*, 31, p. 475], apparently associated with poor standards of cultivation. Soy-beans at Rubare Farm were damaged severely by an [unspecified] virus. Although cassava mosaic was still prevalent good progress was made in distributing resistant varieties: about 760 acres of resistant cassava were planted in Ankole during the year.

Conners (I. L.). **Thirty-third Annual Report of the Canadian Plant Disease Survey, 1953.**—xv+124 pp., 1 pl., 1 diag., 1 graph, 3 maps, 1954. [Mimeoprinted.]

In the section of this report [cf. *R.A.M.*, 33, p. 709] dealing with new or noteworthy diseases (pp. ii–viii) [also given in French] it is stated that in 1953 *Puccinia graminis* [see next abstract] was responsible for the loss of 25,000,000 bush. of wheat, being epidemic in Manitoba and south-eastern Saskatchewan, and more serious on durum wheat than on bread wheat. The losses were the heaviest since 1935, race 15B–1 predominating. Two collections were made of a new race, 15B–3, to which Selkirk [loc. cit.] and McMurachy were susceptible.

The most important sources of infection of the new crop by wheat streak mosaic virus [33, p. 717] are volunteer plants.

Fungus diseases of soy-bean were of little importance during the period under review, but *Xanthomonas phaseoli* var. *sojense* was found on soy-beans in Ottawa, a new record for Canada.

As in 1952, potato blight (*Phytophthora infestans*) [33, p. 709] was reported from every province; tuber rot was severe in British Columbia, but less so in central Alberta, eastern Saskatchewan, and north-eastern Quebec [34, p. 135]. The variety Sebago was highly resistant to *Synchytrium endobioticum* [loc. cit.], even under favourable weather conditions for the fungus in Newfoundland, where losses from the disease were severe.

Virus diseases of the aster yellows type were reported on carrots, celery, parsnips, spinach, onions, squash, potatoes (as purple top), flax, sunflower, and rape.

Onion pink rot has been shown to be primarily a deficiency disorder, being rectified by the addition of manganese. An outbreak of bacterial blight (*Bacterium stewartii*) [*Xanthomonas stewarti* on maize: 32, p. 174] was observed for the first time in Canada since 1933. Tomato ghost spot, caused by *Botrytis cinerea*, was newly reported as also was *Pseudomonas syringae* on Lima beans [*Phaseolus lunatus*] in Ontario.

Venturia inaequalis [34, p. 433] was prevalent on apple during the period under review, particularly in the British Columbia interior.

Among new records of interest on trees and shrubs were *Verticillium dahliae* on *Lonicera morrowi* in Ontario, *Taphrina populi-salicis* on poplar in British Columbia, and *Phleospora ulmi* on elm in Nova Scotia. *Melampsora occidentalis* on *Populus trichocarpa* and *M. albertensis* on *P. tremuloides* have aecidial states on *Pseudotsuga*. On ornamentals new diseases included boron deficiency in gloxinia in Prince Edward Island, *Alternaria raphani* on *Matthiola* in Quebec, and the second record of [chrysanthemum] rust, *Puccinia chrysanthemi* [C.M.I. map No. 117], in Ontario. Embodied in the report are a number of special contributions including one concerning the occurrence of ergot [*Claviceps purpurea*: *R.A.M.*, 29, p. 141] on wheat, barley, and rye in western Canada, by I. L. Conners (pp. 23–28). In a survey conducted in 1953 the percentages of wheat fields infected with ergot in Manitoba, Saskatchewan, and Alberta were 7, 10·4, and 13·3, respectively; of barley, 7·1, 20·7, and 7·2; and rye, 100, 66·7, and 53·4, respectively. The level of infection in rye fluctuated considerably over a period of years, 15·3 per cent. of the crop being graded ergoty in 1942–3, 0·2 in 1951–2, and 7·7 in 1953.

W. E. Sackston contributed notes on sunflower diseases in Manitoba in 1953 (pp. 45–48). Severe systemic infections of downy mildew (*Plasmopara halstedii*) [C.M.I. map No. 286], the highest since recordings began in 1948, were observed. More than one per cent. of the sunflowers in a Winnipeg nursery were affected. In one farm field 60 per cent. infection was noted, with patches in which 95 per cent. of the plants had been killed by the disease.

Annual Report of the Director, Experimental Farms Service, 1953–1954.—43 pp., 12 figs., 1 map, Department of Agriculture, Ottawa, Canada, 1955.

In the section of this report [cf. *R.A.M.*, 31, p. 370] dealing with cereal crops (pp. 11–15) it is stated that the new spring wheat Selkirk [33, p. 589], licensed for sale in Canada in 1953, withstood well a severe epidemic of race 15B of stem rust [*Puccinia graminis*: 34, p. 432 and preceding abstract] in that year and yielded considerably more than the commercial varieties in the rust area. In a preliminary test for resistance to dwarf bunt [*Tilletia controversa*: loc. cit.] the winter wheat Richmond (formerly Ottawa 2623 A) proved less susceptible than the varieties at present grown in Ontario. The new hybrid Ottawa 3909 C, a soft white winter wheat resistant to leaf rust [*P. triticina*: loc. cit.], has given excellent yields.

The new oat variety Rodney [loc. cit.] is resistant to Victoria blight [*Helminthosporium victoriae*]. Black stem or culm rot of oats, caused by *Septoria avenae* [*Leptosphaeria avenaria*], was again prevalent in eastern Canada in 1953 and, judging from plot infection at widely separated points in Ontario and Quebec, may have caused considerable damage. Of over 100 varieties planted experimentally

in five different areas in eastern Canada, four non-commercial varieties of the common oat and seven varieties of wild species displayed resistance at all five places.

Brandon 3962–4, a hybrid barley derived from Mensury, Newal, Peatland, and Plush, displayed very good resistance to *H. sativum* [34, p. 433].

In the horticulture section (pp. 23–28) the results are given of strawberry indexing for the control of virus diseases [30, p. 508]. They continue to indicate that the present isolation measures are adequate, only a negligible percentage of recently selected seedling varieties giving positive results in tests for viruses. The attempt, begun in 1949, to discover virus-free plants of some of the better earlier introductions has been abandoned since no healthy plants have been found in the large number of clones brought in from many areas.

A hybrid muskmelon 9–201, now named Harper, developed at the Harrow Experimental Station, appears to be resistant to *Fusarium oxysporum* f. *melonis* [cf. 32, p. 580], which is prevalent locally. In four years' trials Harper gave approximately 40 per cent. more yield than the other resistant variety, Iroquois [24, p. 352].

In the report of the tobacco division (pp. 33–36) the new Burley variety, Haronic, developed at Harrow for resistance to black root rot [*Thielaviopsis basicola*: 34, p. 492], is stated to have grown very well in 1953.

MUNGOMERY (R. W.). **Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd* 53, pp. 37–47, 1 pl., 1953.

It is stated in this report [cf. *R.A.M.*, 33, p. 51] that ratoon stunting virus [34, p. 547], present in all sugar-growing districts of Queensland and in the Tweed River area of New South Wales, was less harmful than usual in the 1952–3 growing season, probably because of the favourable growing conditions which existed. Following discussions at the 1953 Conference of Cane Pest and Disease Control Boards a number of Boards each planted some 100 acres with hot water-treated cane to be used in the following year as important sources of clean planting material. Most of the information on the hot-water treatments reported by C. G. HUGHES (pp. 43–47) has already been noticed [33, p. 320].

Chlorotic streak [34, p. 183] has caused some concern as it spreads into healthy stands more rapidly than ratoon stunting and may jeopardize clean seed schemes against the latter disease. Despite extensive tests no insect vector of the virus has yet been found.

Eradication of Fiji [virus] disease [34, p. 256] appears to be in sight. The number of diseased stools rogued by the Cane Pest and Disease Control Board amounted to 13 in the Rocky Point area, 35 at Moreton, and 14 in the Bundaberg area, i.e., a sixth of those found in the same districts last year. Control measures, including early harvest or ploughing, are being intensified, and the early eradication of the disease from commercial cane plantings in Queensland is confidently anticipated.

Pineapple disease (*Ceratostomella* [*Ceratocystis*] *paradoxa*) [34, p. 183] was more prevalent than usual. Treating the setts with a mercurial solution (0·015 per cent. mercury in the cold dips and 0·003 per cent. where used with hot-water treatment) is proving to be effective and economical. Sprays fitted to the chute of the cutter-planter are replacing immersion tanks, and a machine, consisting of a circular saw for cutting the setts, a mercury bath, a conveyor belt, and a bagging station, has been devised and is recommended for district use on a contract basis.

Leaf scald (*Bacterium* [*Xanthomonas*] *albilineans*) has again been observed on Q. 44, Trojan, and to a lesser extent S.J. 4 and Badila varieties in wetter localities of North Queensland. In the leaf-scald resistance trials at the Pathology Farm, Eight Mile Plains, Co. 301, N.Co. 310, P.O.J. 2878, Q. 28, Q. 42, Q. 47, Q. 50, and Vesta were free from the disease [34, p. 107].

A stem rot associated with large growth cracks (common in Pindar) was observed in small sections of some fields. No pathogen could be isolated from the affected parts, the rot being internal and affected stalks appearing outwardly normal. The rot is believed to be an expression of over-maturity, Pindar being an early-maturing cane.

Only one strain (not lethal) of sugar-cane mosaic virus is believed to be present in Queensland. The eradication of mosaic in the Inkerman area on the Burdekin River delta marks the successful culmination of a programme of roguing and 'seed' control by the Queensland control board.

A disease, provisionally named 'spindle stripe disease', was recorded on the Q. 50 variety in the Mt. Bauple district of south Queensland during the previous season and in the Maryborough area this season. Only the younger leaves show disease symptoms which consist of regular streaks up to 3 mm. wide, slightly paler than normal and rather inconspicuous. Diseased stalks show some stunting, especially in the ratoons, and an oval rather than circular cross-section. Growth cracks are more numerous and severe than in normal cane and fine striations, extending vertically from the growth ring to the wax band, occur in all internodes except at the base of the stalk. The striations also appear on the leaf sheaths. Some change is apparent in leaf texture, and a waviness of the edges occurs but, even so, affected tops are not easily detected. No pathogen or invading organism could be observed. The disease is systemic, infected stools yielding setts which produce diseased plants.

Miller (P. R.). **Plant disease situation in the United States.**—*F.A.O. Pl. Prot. Bull.*, 3, 3, pp. 38–40, 1954.

Wheat streak mosaic [*R.A.M.*, 34, p. 89] was observed in wheat-breeding nurseries in Washington State in June, 1954, this being, apparently, the first record of a virus disease of wheat in the Pacific northwest. Inoculum from diseased material produced typical symptoms on greenhouse-grown seedlings (at 85° to 93° F.) of Michigan Amber wheat, Golden Giant maize, and smooth crabgrass (*Digitaria ischaemum*), but not on *Chenopodium album*. False stripe virus [cf. 33, p. 717; 34, p. 222] was present in an adjacent barley nursery, and inoculations to wheat with this virus gave stripe-mosaic symptoms. A brief survey of wheat and barley fields in the Pullman area of Washington failed to disclose the presence of either virus.

The isolation of *Cercosporella herpotrichoides* [C.M.I. map No. 74] from Cornell 595 wheat collected in Tompkins County, New York, in June, 1953, appears to be the first record of the disease in the eastern part of the United States. The pathogenicity of the New York isolate was demonstrated by inoculating greenhouse-grown plants of Cornell 595, Genesee, and Yorkwin wheat and Mohawk oats, the resulting symptoms resembling those seen on naturally infected wheat in the field. The fungus was reisolated from the inoculated plants. Among Cornell Herbarium specimens of wheat infected by foot-rot organisms one, labelled *Rhizoctonia solani*, bore stromata characteristic of *C. herpotrichoides*. This specimen, on Yorkwin wheat collected on 20th June, 1944, appears to be the earliest New York collection of *C. herpotrichoides* on wheat. In a survey of some western and central New York winter wheat fields made in May, June, and July, 1954, symptoms of *C. herpotrichoides* foot rot were noted in 25 counties and in almost every field examined. Of 50 isolates obtained 16 have sporulated and all confirm the initial identification.

Phytopathologie. [Phytopathology.]—*Courr. Cherch. Off. Rech. sci. Outre-Mer* 8, pp. 159–186, 1954. [Received April, 1955.]

In this report [cf. *R.A.M.*, 34, p. 350] J. Chevaugeon notes that in French West Africa the cryptogamic flora of cassava presents the following points of interest.

The Basidiomycetes are represented almost exclusively by Polyporaceae and Agaricaceae; no Uredineae have been found, and the greatest caution will have to be exercised in introducing into French West Africa cassava plants from Central or South America, where rusts are present. A study of 15 varieties from the Ivory Coast showed that none was immune from the three major diseases, *Glomerella cingulata* f.sp. *manihotis* [cf. 34, p. 509], *Cercospora henningsii* [loc. cit.], and *C. caribaea* [loc. cit.], but there were varietal differences in susceptibility. A parallelism was noted between host reactions to *C. henningsii* and *C. caribaea*, but resistance to *G. cingulata* f.sp. *manihotis* was inherited independently. Ageing of the host favoured the development of the three diseases, and the age of an organ affected the nature of the necrotic symptoms induced by *G. cingulata* f.sp. *manihotis*: secondary stems reacted by forming cankers, and this limited the spread of the parasite, whereas young organs were killed. The susceptibility of the leaves to *C. henningsii* and *C. caribaea* increased during the month after they opened, but later on variations in this susceptibility became negative or insignificant. Reduction in the vigour of the host, whether due to excessively dense planting or to impoverishment of the soil, favoured infection by *G. cingulata* f.sp. *manihotis*, but had no effect on infection by *C. henningsii* and *C. caribaea*.

G. cingulata f.sp. *manihotis* attacks phanerogams of widely different families (*Ricinus*, *Aleurites*, *Jatropha*, *Carica*), and may invade all the aerial organs. Its geographical distribution is almost the same as that of cassava in French West Africa. Experimental evidence showed that of the three fungi it adapts itself best to a wide range of physical and chemical environmental conditions, though requiring abundant oxygen during the germination of the spores. *C. henningsii*, with a high optimum temperature can, if humidity requirements are satisfied, infect cassava in all parts of West Africa, especially savannahs and open forests or forests opened up by cultivation, where maximum humidity is far below saturation, though *C. caribaea* is confined to cassava and dense forest areas. Relative minimum humidities of 70 and 78 per cent. are the critical values for the activity of the two fungi, respectively.

M. Delassus found that infection of groundnuts by the complex *Cercospora personata* [32, p. 661; 33, p. 758], *Colletotrichum mangenoti* [32, p. 91], and *Pleosphaerulina* sp. was reduced by soil applications of phosphatic fertilizers. In Middle Casamance [Senegal], *Pennisetum typhoides* was recently attacked by *Puccinia penniseti* [C.M.I. map No. 225] for the first time.

M. Luc from observations made on 100 maize stools in the Ivory Coast concluded that the more severely a plant is infected by *P. polysora* [cf. *R.A.M.*, 34, p. 145] the less severe will be subsequent infection by *Helminthosporium maydis* [*Cochliobolus heterostrophus*: 33, p. 758]. In estimating losses due to rust and selecting varieties resistant to it, the effect of *C. heterostrophus* should not be overlooked. Of 200 maize varieties in the collection at Adiopodoumé, the only one unquestionably resistant to *P. polysora* was Cuba Amarillo. The best results in a seed disinfection test against destructive fungi (*Fusarium*, *Curvularia*, *Penicillium*, and *Diplodia*) were given by copper sulphate pulverized and mixed with the seeds for 1½ hours.

The most important disease occurring in an experimental rice planting was *H. oryzae* [*Ophiobolus miyabeanus*: 34, p. 175], which was abundant, especially on stools insufficiently irrigated or growing in sandy soil.

Mme R. Resplandy observed that important losses were caused to maize in the vicinity of Adiopodoumé by *Corticium solani*, locally very prevalent on this host, though not yet reported from the Ivory Coast. Laboratory experiments appeared to confirm field observations that maximum infection occurs only on plants which have reached the male flowering stage at least. Young plants are not killed by *C. solani* unless growing under unsatisfactory conditions and exposed to heavy infection. *Darluca filum* was of great importance on *Puccinia polysora*.

F. Bugnicourt states that the so-called 'New Hebrides' taro [*Colocasia* sp.] growing on the eastern coast of New Caledonia is widely affected by a root rot attributed to *Pythium irregulare* [cf. 20, p. 512]. It has caused heavy losses in native plantings. The Solo variety of papaw is highly susceptible to root rot (*P. aphanidermatum*).

Investigations conducted by R. Dadant over a period of several years proved that infection of *Coffea arabica* by *Hemileia vastatrix* [33, pp. 422, 615] is strictly dependent on the microclimate, being serious only in insufficiently shaded plantations. In rainy years it causes no damage, and is, therefore, comparatively unimportant in New Caledonia. In the field only *C. arabica* is susceptible to *Corticium koleroga* [loc. cit.], which is favoured by and causes appreciable damage in excessive shade and weak light, especially with high humidity. Further investigations of the very damaging tracheomycosis of *Coffea robusta* caused by *Thielaviopsis neocaledoniae* [33, p. 422] indicated that pruning wounds should be painted over in the usual way [with a fungicide]. Control of thread blight (*Corticium penicillatum*) [33, p. 412] of coco-nut palms is dependent on the fact that the fungus requires certain definite conditions of humidity and shade.

H. Barat, reporting from Madagascar, states that diseases recorded there for the first time since 1945 include *Sclerotium oryzae-sativae* [*Leptosphaeria salvinii*: cf. 26, p. 415] and *Piricularia oryzae* on rice, (?) *Hypochnus* [*C.*] *sasakii* [cf. 33, p. 367] on sugar-cane, *Marasmius scandens* [cf. 34, p. 86] on cacao, (?) *Uromyces nyikensis* on gladiolus, court-noué (? virus) of vine, and *Verticillium* wilt (*V. albo-atrum*) and leaf roll virus of potatoes [cf. 33, p. 659].

J. Brun states that investigations at the phytopathological laboratory of the Central Station, Foulaya, French West Africa, confirmed the conclusion that 'blue' disease of bananas [33, p. 242] is due to an unbalanced potassium-magnesium ratio: field tests showed that it should be approximately 1 to 8. The form of banana rot present in the Cameroons and frequently referred to as 'cigar-end rot' does not appear to be caused mainly by *Stachylidium* [*Verticillium*] *theobromae*, but by *Trachysphaera fructigena* [cf. 33, p. 757; 34, p. 86]. 'False mosaic' disease of banana, apparently due to *Hormodendrum* sp., has spread throughout French Guinea in less than a year. *Cercospora* [*Mycosphaerella musicola*: C.M.I. map No. 7] appeared in French Guinea in 1952. A species of *Hypomyces* was isolated from a canker of passion-fruit vine.

Studies by G. Merny at the Antilles Station of the Institute of Colonial Fruits and Citrus Fruits, Neufchâteau, Guadeloupe, demonstrated that in heavily infected areas treatments against banana leaf spot (*M. musicola*) [34, p. 467] should be continued from April to December; they may be omitted in January and February and resumed in March.

Tsujita (M.) & Matsui (C.). **A double lysogenic strain of Pseudomonas solanacearum.**—*Proc. Japan Acad.*, 31, 3, pp. 180-185, 1 diag., 1955.

At the Japanese National Institute of Genetics, inoculation of lysogenic cells of strain S-9 of *Pseudomonas solanacearum* [*R.A.M.*, 33, p. 340] with the temperate phage T c200 resulted in the formation of a double lysogenic strain. A cell of this new strain spontaneously liberated a new type of phage with the host specificities of T-c200 and S-9, and which appears to have originated from recombination in the prophage stage of genes in the parental phages.

Sabet (K. A.). **On the host range and systematic position of the bacteria responsible for the yellow slime diseases of Wheat (Triticum vulgare Vill.) and Cocksfoot Grass (Dactylis glomerata L.).**—*Ann. appl. Biol.*, 41, 4, pp. 606–611, 1 pl., 1954.

In an investigation at the Department of Agricultural Botany, University of

Cairo, inoculations of the leaves and shoots of *Dactylis glomerata* and wheat with *Corynebacterium rathayi* [cf. *R.A.M.*, 14, pp. 492, 571; 32, p. 234], alone and combined with *Anguina* [*Anguillulina*] *tritici*, failed to cause infection. Inoculations made through the soil with *C. rathayi* or *C. tritici* [32, p. 618], both with *A. tritici*, caused infection of wheat only, the symptoms resembling those of yellow slime on *D. glomerata*. The following hosts, which were not affected by eelworms alone, were also not infected by either bacterium associated with eelworms: *D. glomerata*, *Hordeum vulgare* var. *pallidum*, *H. distichum* var. *erectum*, and oats. Four species of wheat (*Triticum vulgare*, *T. pyramidale*, *T. durum*, and *T. dicoccum*) were more or less susceptible to both bacteria when combined with eelworms, and both produced similar symptoms, though *C. rathayi* was less aggressive on wheat than was *C. tritici*. The number of plants affected by eelworms and bacteria together was much higher than the number affected by eelworms alone. This was most marked with *T. durum*, which was resistant to eelworm attack, but not to eelworms and the bacteria together; in one set of experiments with this host, for example, one out of 52 plants was affected by eelworm alone, whereas 19 out of 57 were attacked by *C. rathayi* and eelworm together.

It is concluded that the successful invasion of wheat by the bacteria is brought about by their transport into the plant by *A. tritici*, a similar association probably existing between *C. rathayi* and an eelworm capable of infesting *D. glomerata*. *C. tritici* and *C. rathayi* closely resemble each other in cultural characters, and differ physiologically only in their action on mannitol. It is suggested that *C. tritici* is a geographical or subtropical form of *C. rathayi* and should be regarded as a variety of it.

Ekstrand (H.). **Höstsädens och vallgräsens övervintring. Sammanfattning av hittills utförda och program för fortsatta undersökningar.** [The overwintering of autumn-sown cereals and forage grasses. Summary of investigations carried out hitherto and programme for the future.]—*Medd. Växtskyddsanst. Stockh.* 67, 125 pp., 24 figs., 10 graphs, 1955. [English summary, pp. 107–122.]

In this important, fully tabulated monograph the results of previous investigations on the overwintering of cereals and forage grasses in Sweden are amplified and brought up to date. Much of the information has already been noticed [*R.A.M.*, 27, p. 416; 31, p. 550 *et passim*]. Weather conditions in the autumn and winter of 1949–50 were highly conducive to the development of *Calonectria graminicola* [*C. nivalis*], and cereals (especially rye) and grasses were heavily attacked throughout the country. Infection evidently originated in the soil, since the seed of the 1948 and 1949 harvests was generally of superior quality.

Like other winter pathogens, *Typhula itoana* [33, p. 743] is favoured by early sowing (first week in September). Particularly susceptible are the Ergo and Robur wheat varieties, while Virtus is among the more resistant. Barley and various grasses are also liable to infection by *T. itoana*, but so far no observations have been made on varietal reaction.

Diagnoses are given of *T. borealis* [19, p. 351; 33, p. 743] and *T. hyperborea* (*Växtskyddsnotiser, Stockh., 1939*, p. 17, 1939). Hosts of the former species, besides some already mentioned, include *Dactylis glomerata*, *Poa serotina*, *Festuca pratensis*, red fescue [*F. rubra*], sugar beet, iris, and tulip, and of the latter (which appears to be confined to the extreme north) rye, wheat, *D. glomerata*, *Lolium perenne*, *F. rubra*, and *P. serotina*. *T. borealis* is characterized by globose, brown to black sclerotia, up to 1·5 mm. in diameter, sporophores up to 30 mm. in length, and basidia bearing four ovate or oblong-ovate to subcylindrical basidiospores, 5·5 to 13·25 by 2 to 4·5 (average 8·9 by 3·2) μ. The basidiospores of *T. hyperborea* are ovate to short-oviform, curved, and measure 5·5 to 11 by 2·75 to 5·75 (8·4 by 4·3) μ, and another difference between the two species is the brown pigmentation of the medium

by *T. borealis* but not by *T. hyperborea*. The optimum and maximum temperatures for the development of *T. borealis* are 10° and 20° C., respectively, and for *T. hyperborea* 5° and 15° to 20°, respectively.

Sclerotinia borealis [*R.A.M.*, 32, p. 11] is highly pathogenic to wheat and barley, rye being less susceptible; it also causes heavy damage to grasses, especially *D. glomerata* and *L. perenne*.

Practical applications of the results obtained to date include as control measures the selection of varieties and strains of overwintering crops resistant to winter-killing fungi; seed treatment with a reliable mercurial; use of seed of local provenance; and liberal provision of soil amendments, especially phosphorus.

Large (E. C.). **Growth stages in cereals.**—*Plant Path.*, 3, 4, p. 129, 1 fig. (on p. 128), 1954.

A scale, based on that made for wheat by W. Fukes (*Vers. XVII Tech. Tarwe Comm. Groningen*, pp. 560–561, 1941), with additional notes by the late F. Earnshaw and the author's illustrations from plants in the field, has been used extensively in investigational work on wheat, oats, barley, and rye in England and Wales during the past four years. It is used for defining the course of growth in relation to seasonal conditions and variety, and for indicating the stage of growth when disease assessments are made. On this scale tillering comprises stages 1, with one shoot ('brairding') to 5, with pseudo-stem strongly erected; stem extension comprises stages 6, first node of stem visible at base of shoot, to 10, sheath of last leaf completely grown out, ear swollen but not yet visible; heading comprises stages 10·1, with first ears just visible (awns just showing in barley, ear escaping through split of sheath in wheat or oats) to 10·5, all ears out of sheath; flowering (wheat) covers stages 10·5·1, the beginning of flowering, to 10·5·4, flowering over, kernel watery-ripe; and ripening stages 11·1, milky ripe, to 11·4, ripe for cutting, straw dead.

Mattern (P. J.) & Livingston (J. E.). **The effect of three leaf and stem rust chemotherapeutants on the baking behaviour of Wheat.**—*Cereal Chem.*, 32, 3, pp. 208–211, 1 fig., 1 graph, 1955.

At the Nebraska Agricultural Experiment Station milling and baking tests were performed on Pawnee hard red winter wheat which had been treated twice (at 10- to 14-day intervals) during the growing season with calcium sulphamate, actidione, or calcium sulphanilate for the control of leaf and stem rusts [*Puccinia triticina* and *P. graminis*: *R.A.M.*, 33, p. 341]. The first-named gave excellent results in the field but induced deleterious changes in the harvested seed which impaired its baking properties. The other two chemicals were effective against the rusts and exerted no adverse influence on the quality of the flour.

Gassner (G.) & Niemann (E.). **Synergistische und antagonistische Wirkung von Pilzen und Bakterien auf die Sporenkeimung verschiedener Tilletia-Arten.** [Synergistic and antagonistic action of fungi and bacteria on the spore germination of various *Tilletia* species.]—*Phytopath. Z.*, 23, 4, pp. 395–418, 10 figs., 1955.

This is an expanded account and discussion of *in vitro* studies at the Biological Institute, Brunswick, on the synergistic or antagonistic action of various fungi and bacteria on spore germination in *Tilletia caries*, *T. brevifaciens* [*T. controversa*], and *T. secalis*, the essential information on which has already been noticed [*R.A.M.*, 34, p. 357].

Vanderwalle (R.) & Detroux (L.). **Sur la persistance de la virulence des spores de carie (Tilletia tritici Berk.) incorporées au sol et l'action de quelques désinfectants à sec.** [On the persistence of the virulence of bunt (*Tilletia tritici*

Berk.) spores incorporated in the soil and the action of some dry disinfectants.] —*Parasitica*, 10, 1, pp. 14–17, 1 graph, 1954.

In an experiment carried out at the State Phytopathological Station, Gembloux, Belgium, plots 2 sq. m. in area were each infested with a suspension of 300 mg. of chlamydospores of *Tilletia tritici* [*T. caries*: *R.A.M.*, 34, p. 209] in 4 l. of water. Plots sown on 29th October, 1952, six weeks after inoculation with Ministre wheat treated with 11 per cent. hexachlorobenzene [31, p. 110], 20 per cent. pentachloronitrobenzene, and two organic mercury products had in July, 1953, an average of 0, 0, 0·3, and 0·3 diseased ears, respectively. The fact that the corresponding figures for inoculated and non-inoculated plots sown with untreated seed of the same variety were 4 and 3·75 confirms the conclusion reached by other workers that the spores of *T. caries* lose their viability in damp soil in 30 to 60 days [3, p. 512].

Newburgh (R. W.), Claridge (C. A.), & Cheldelin (V. H.). **Carbohydrate oxidation by the Wheat smut fungus, Tilletia caries.**—*J. biol. Chem.*, 214, 1, pp. 27–35, 4 graphs, 1955.

The study at Oregon State College of the oxidative behaviour of the wheat bunt fungus, *Tilletia caries*, was facilitated by the development of a liquid medium consisting of 5 gm. tryptone, 10 gm. glucose, and 1 gm. yeast extract per l., which permitted copious growth in a 24-hour period. Acetone extracts were prepared containing hexokinase, aldolase, glucose-6-phosphate dehydrogenase, 6-phosphogluconic acid dehydrogenase, and the enzymes of the pentose cycle.

Oxidation of glucose, maltose, starch, and (to a limited extent) of fructose and sucrose was demonstrated, but the use of various Krebs-cycle acids as substrates resulted in only slight activity.

Winkelmann (A.). **Untersuchungen zur Bekämpfung des Gersten- und Weizenflugbrandes.** [Investigations on the control of Barley and Wheat loose smuts.] —*Angew. Bot.*, 29, 1, pp. 3–13, 1 fig., 1955.

A tabulated account is given of experiments at the Plant Protection Bureau of the Westphalia-Lippe Chamber of Agriculture, Münster, Germany, on the control of the loose smuts of barley and wheat (*Ustilago nuda* and *U. tritici*) [cf. *R.A.M.*, 32, p. 123]. Complete elimination was effected by three hours' exposure of the seed to steam heated to between 50° and 53° C. in a specially constructed apparatus comprising a continuously rotating sheet metal cylinder connected with a generating flask. With the addition of alcohol (5 ml. per 500 kg. seed) after the first hour of treatment, the period could be reduced to two hours. The average adsorption of water ranged from 8 to 9 per cent. and reached a maximum of 12·09 per cent. after three hours' vapour treatment.

Schaller (C. W.). **Inheritance of resistance to net blotch of Barley.**—*Phytopathology*, 45, 3, pp. 174–176, 1955.

In further studies at the Department of Agronomy, University of California, Davis, on the genetics of resistance to net blotch (*Pyrenophora teres*) in Tifang barley [*R.A.M.*, 32, p. 123], a single gene pair, herein designated Pt, was found to be operative in the case of Tifang×Atlas hybrids. Resistance is incompletely dominant. Differences in hair length on the rachis margin are also governed by a single gene pair, but the two characters appear to segregate independently.

Blair (I. D.). **Nutrition and survival of Cercosporella herpotrichoides Fron. and aspects of the Wheat eyespot disease.**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 3, pp. 207–220, 1 fig., 3 graphs, 1954.

Much of this information on the nutritional requirements of *Cercosporella herpotrichoides* causing eyespot disease of wheat has already been noticed [*R.A.M.*, 32,

p. 370; 33, p. 214]. Further studies disclosed that the optimum concentration of peptone for growth in a basal mineral salts medium with glucose was 0·5 per cent. The fungus was able to utilize inorganic nitrogen provided the pH was kept at the optimum (circa 8). Stubble burning was more effective in reducing infective matter than deep or surface cultivations. Wheat lodging was less severe on heavy land where ryegrass (*Lolium perenne*) was encouraged to develop beneath the wheat crop. It is suggested that the undercover may act by reducing the nitrogen supply to an extent unfavourable to the development of *C. herpotrichoides*. Despite the presence of diseases, statistics show that the average wheat yield in New Zealand is steadily increasing.

GRAINGER (J.). **Spore production by Helminthosporium avenae.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 412–419, 1 pl., 1 diag., 5 graphs, 1954.

For spore-trapping studies at the West of Scotland Agricultural College, Auchincruive, Ayr, an 'impinger' spore trap was employed, consisting of a vaselined slide held in a container 0·5 mm. from an orifice 5 × 1 mm., suction being provided by an Edwards 'type IV' vacuum pump and the exhaust air pumped through an ordinary gas meter to measure the volume. Spores of *Helminthosporium* [*Pyrenophora*] *avenae* were liberated into the air in similar numbers per unit of leaf area during the primary (seedling blight) and secondary (leaf spot) phases in a field of Star oats [*R.A.M.*, 13, p. 158]. The spores occurred during both day and night; most were found at ground level. There was no correlation between the number of spores and temperature, relative humidity, or wind velocity. None was found in the surrounding air during the intervening period of disease-free growth.

It appears, therefore, that some factor, probably connected with the host plant itself, depresses or inhibits the activity of the fungus in relation to the host between the two disease phases.

ROSEN (H. R.). **New germ plasm for combined resistance to Helminthosporium blight and crown rust of Oats.**—*Phytopathology*, 45, 4, pp. 219–221, 2 figs., 1 graph, 1955.

A number of selections derived from a mutant of Tennessee 1922 × Bond-Iogold oats at the Arkansas Agricultural Experiment Station constitute a new source of germ plasm for combined resistance to physiologic races 45, 57, and 101 of *Puccinia coronata* [cf. *R.A.M.*, 34, pp. 222, 363] and to *Helminthosporium sativum* var. *victoriae* [*H. victoriae*: 33, p. 476 *et passim*]. Most of them are also winter-hardy under local conditions.

In controlled experiments the unique form of resistance to *P. coronata* residing in these selections was expressed primarily at temperatures averaging below 70° F. [34, p. 31]. Thus, at 60° they exhibited an immune-type reaction, while at 70° to 76° they were fully susceptible. During most of the winter oats-growing season in the State the average temperatures are below 70°.

LUND (S.) & SHANDS (H. L.). **Seedling infection of Oats caused by Septoria avenae.**—*Phytopathology*, 45, 3, pp. 181–182, 1 graph, 1955.

The occurrence of severe natural infection of oats by *Leptosphaeria avenaria* in Wisconsin in 1952 afforded an opportunity for further studies on the pathogenicity of the fungus in the early stages of seed germination [*R.A.M.*, 32, p. 426]. In greenhouse tests in 1953 seedling infection was heavier at a high moisture level and a temperature of 24° C. than with low moisture and temperatures of 16°, 20°, or 28°. Similar results were obtained in another series of tests. Some of the more heavily infected seedlings were transplanted to pots filled with unsterilized soil and moved to a house maintained at 18°. All the plants appeared to outgrow the

seedling phase of the disease, no signs of which were discernible at maturity. Five isolates from the seedling lesions induced characteristic symptoms on a susceptible variety and one gave rise to typical spores.

Treatment of seed of the susceptible La Salle variety with ceresan M at the rate of ½ oz. per bush., followed by a week's storage and planting in wet sand, reduced the incidence of infection at the end of four weeks from 42·5 to 13 per cent., with no serious lesions.

Fitzgerald (J. N.). **Molybdenum on Oats.**—*N. Z. J. Agric.*, 89, 6, p. 619, 1 fig., 1954. [Received 1955.]

The results of experiments carried out conjointly by the Department of Agriculture's Invermay Research Station, Taieri, and Rukuhia Soil Research Station, Hamilton, New Zealand, from 1951 to 1954, inclusive, showed that the application of sodium molybdate [cf. *R.A.M.*, 33, p. 729] (5 oz. per acre with seed or 2½ oz. per acre with seed followed by 2½ oz. per acre as foliar spray after tillering) significantly increased oat yields (57·9 and 58·5 bush. per acre, respectively, in 1954 compared with 39·5 for those receiving no molybdenum) [cf. 32, p. 619] on a molybdenum-deficient soil. The treated plants were distinguished by a healthy green colour, erect growth, and no leaf wilting.

Pöhm (M.). **Über das Vorkommen von Ergotamin in Spanischem Mutterkorn.** [On the occurrence of ergotamine in Spanish ergot.]—*Experientia*, 10, 11, p. 460, 1954. [English summary.]

The analysis by a method involving paper chromatography and quantitative determination (*Naturwissenschaften*, 40, p. 244, 1953; 41, p. 63, 1954) of over 100 samples of Spanish rye ergot [*Claviceps purpurea*: *R.A.M.*, 34, p. 292] at the pharmaceutical factory of A. V. Waldheim, Vienna, revealed (for the first time in material from this source) the presence of ergotamine in amounts equivalent to between 3 and 8 per cent. of the total alkaloid content.

Lafon (R.). **Les fusarioses du Maïs et le traitement des semences.** [Maize fusarioses and seed treatment.]—Reprinted from *Rev. Zool. agric.*, *1953*, 7–9, 5 pp., 1953.

Maize in France is subject to cob and stalk rots and to parasitic lodging caused by the three *Gibberella* spp. occurring in the United States [*G. fujikuroi* and its var. *subglutinans* and *G. zeae*: *R.A.M.*, 30, p. 607]. Damage was particularly severe in 1949. In spring, 1953, tests were carried out at the Maize Experiment Station, Saint-Martin-de-Hinx, on grain artificially inoculated with *G. zeae* to determine the efficiency of 13 seed treatments [25, p. 340] and their effect on the germination of treated seeds of Wisconsin 355 and Grand Roux Basque stored in paper bags and jars prior to sowing. In the field trials, methoxyethylmercury alone [cf. 31, p. 26] gave promising results, but only if applied just before sowing, which should be at wide spacing. It seriously reduced germination of Grand Roux Basque seed stored for two months in jars and of Wisconsin 355 stored for over a year in paper bags. Thiram formulations were the least damaging.

Control of *G. zeae* lies primarily in cultural practices such as destroying diseased cobs and lodged plants, preventing attack by insects which afford an entry for the pathogen, storing seed under hygienic conditions, and rotating maize with a crop other than another cereal.

Safeeulla (K. M.) & Thirumalachar (M. J.). **Resistance to infection by Sclerospora sorghi of Sorghum and Maize varieties in Mysore, India.**—*Phytopathology*, 45, 3, pp. 128–131, 5 figs., 1955.

The reactions to infection by *Sclerospora sorghi* of some sorghum and maize

varieties were assessed at Central College and Malleswaram, Bangalore, South India, by inoculation with conidia and oospores. Conidia were produced by floating fragments of freshly infected leaves on a water surface in Petri dishes and incubating them at 18° to 20° C. A thick felt of conidiophores bearing conidia thus produced on the leaf surface was brushed on young leaves previously wetted with sodium ricinoleate. For inoculation with oospores seeds were dibbled in sterilized soil and covered with inoculum.

The fungus attacked the Kashmir Sweet [*R.A.M.*, 28, p. 392] and Pearl Beauty maize varieties, producing both conidia and oospores, but did not cause the typical symptom of leaf-shredding; Golden Beauty and Sweet Corn remained free from infection. The Bonita, Kasturi Bile, Honnur Bile, and C.O.6 sorghum varieties were also immune, the incidence of infection in the others tested ranging from 10 to 35 per cent. Negative results were obtained in experiments on *Setaria italica*, *Panicum miliare*, *Pennisetum typhoides*, sugar-cane, and *Saccharum spontaneum*.

Tarr (S. A. J.). **Protection of Sorghum against soil fungi, soil pests and covered smut by combined insecticide-fungicide seed dressings.**—*Ann. appl. Biol.*, 41, 4, pp. 578–585, 1954.

In field trials carried out in the Gezira, Anglo-Egyptian Sudan, from 1948–53, on the control of sorghum covered smut (*Sphacelotheca sorghi*) [cf. *R.A.M.*, 28, pp. 114, 284; 33, p. 411] infection was closely associated with soil conditions at and just after sowing and was favoured by cold, wet soil. In irrigated plots of Feterita Managil sorghum from 5 to 25 per cent. smutted heads were obtained by treating seed with spores; sometimes the primary heads were only slightly affected, though the secondary heads, formed after cutting back, displayed considerable infection. As *S. sorghi* attacks only young seedlings it would seem that in these cases the fungus had invaded the plant but had not reached the flowers by the time the heads formed. Rapidly growing plants thus tended to have fewer smutted heads than less vigorous ones. The trials showed that powders containing 25 or 50 per cent. thiram used as a seed dressing at the rate of 1 gm. per lb. of seed gave somewhat more effective control than copper carbonate at 1·5 gm. These powders were also reported to be virtually non-poisonous to human beings and animals. Agrosan GN, spergon, and phygon (also reported to be non-poisonous) gave excellent control at 1 gm. per lb. The Feterita varieties used were probably not highly susceptible to *S. sorghi*. It is recommended that the standard seed dressing for sorghum in the Sudan should be 1 gm. per lb. of a powder containing 25 per cent. thiram and 20 per cent. *gamma* BHC. In addition to protecting the seed against *S. sorghi* and certain pests, this dressing should also discourage storage pests.

Wallace (J. M.) & Grant (T. J.). **Virus diseases of Citrus fruit trees.**—*Calif. Citrogr.*, 39, 4, pp. 108, 122–126, 1954. [Received 1955.]

This popular account of the virus diseases of citrus is reprinted from the U.S.D.A. Yearbook of Agriculture [*R.A.M.*, 33, p. 438].

Schneider (H.) & Wallace (J. M.). **Tests on Orange trees top-worked to Lemons.**—*Calif. Citrogr.*, 39, 7, pp. 224, 248–252, 1954. [Received 1955.]

A decline of Eureka lemon [*R.A.M.*, 33, p. 79] top-worked on sweet orange stems on sour orange rootstock infected with quick decline [34, p. 85 and next abstract] in California led to pathological studies of trees top-worked before and after infection with quick-decline virus. Many of the latter passed through cycles of decline and recovery, resulting in varying degrees of stunting. Trees top-worked before infection declined only from causes other than quick decline (e.g., psorosis, lemon sieve-tube necrosis, and sour orange rootstock necrosis). These results suggest that top-working should be done before an appreciable number of trees are infected.

For top-working it is best to use lemon strains free from shell bark, psorosis, and sieve-tube necrosis, and those which do not induce sour orange rootstock necrosis.

Rodney (D. R.) & Boswell (S. B.). **Is sodium a factor in Lemon tree collapse?**—*Calif. Citrogr.*, 39, 9, pp. 316–318, 2 graphs, 1954. [Received 1955.]

Root tissue from sour orange rootstock contained more sodium where the lemon scion (Lisbon or Eureka varieties) was in decline than where it was more vigorous [see preceding abstract]. With a given lemon strain as scion, roots of sour orange rootstocks usually contained more sodium than those of sweet orange.

The roots of a Eureka lemon on grapefruit rootstock combination near collapse had a sodium concentration several times that in roots of healthy trees of the same combination. Root analyses were better than leaf analyses as an index of sodium absorption and possible sodium toxicity.

High sodium content, despite its frequent association with severe decline, should not be taken as being the cause of the disorder, the direct cause being the girdling action of sieve-tube necrosis at or near the bud union [*R.A.M.*, 33, p. 671].

McClean (A. P. D.) & Van der Plank (J. E.). **The role of seedling yellows and stem pitting in tristeza of Citrus.**—*Phytopathology*, 45, 4, pp. 222–224, 1955.

Fraser's demonstration of a consistent qualitative difference in the virus content of five species of citrus exposed to the tristeza virus in New South Wales [*R.A.M.* 32, p. 77; C.M.I. map No. 289] forms the basis of the suggestions here advanced from the Division of Plant Pathology, Pretoria, South Africa, concerning the relationship between tristeza and stem-pitting [32, pp. 428, 621] and the reason for the distinctive reactions to the former virus of Eureka lemon, grapefruit, sour and sweet orange, and mandarin, both on their own roots and in different scion-stock combinations. It is postulated that the tristeza virus is a complex with two components, one of which is an independent agent of stem-pitting in grapefruit, while the other, known as seedling yellows, must also be present to cause drastic stunting and yellowing of Eureka lemon, sour orange, and grapefruit. Self-rooted sweet orange and mandarin trees escape severe injury because they are reasonably tolerant of infection by the entire tristeza virus complex, but on rootstocks like sour orange or grapefruit, which are intolerant of seedling yellows, they sustain heavy damage after the complex has crossed the graft union. Eureka lemon and sour orange scions, on their own or any other roots, tend to escape appreciable injury under conditions of natural infection since they are not invaded by the entire complex but merely by the stem-pitting element, of which they are fairly tolerant. Grapefruit scions also contract infection exclusively by the stem-pitting component, to which, however, they are so susceptible that they develop symptoms of decline [34, p. 296 and cf. preceding abstracts], the process being comparatively slow on their own roots but rather more rapid on sour orange.

Bitters (W. P.), Brusca (J. A.), & Dukeshire (N. W.). **Need for careful selection of Lemon budwood shown by exocortis transmission tests.**—*Calif. Citrogr.*, 39, 3, pp. 70–71, 84–85, 8 figs., 1954. [Received 1955.]

This information on citrus exocortis in California has already been noticed from a different source [*R.A.M.*, 33, p. 421].

Amizet (L.). **Contribution a l'étude de moyens pratiques de lutte contre certaines maladies virusiformes en Algérie.** [A contribution to the study of practical methods of control of certain virus-like diseases in Algeria.]—*Fruits Prim. Afr. N.*, 24, 255, pp. 165–168, 1954.

In Algeria, old citrus orchards are widely affected by various forms of psorosis virus [*R.A.M.*, 30, p. 565; 31, p. 432], scaly-bark psorosis [24, p. 225; 31, p. 63]

being common on every species and variety grown. Practical control consists in the selection of healthy stocks and scions, methods evolved in California to this end [cf. 27, p. 361] being described. Selection should also be aimed at preserving the standard commercial characteristics in any given variety.

Rutherford (D. M.). **Orchard progress in Ventura County.**—*Calif. Citrogr.*, 39, 7, pp. 238, 240–243, 1 fig., 1954. [Received 1955.]

A new method of destroying oak root fungus [*Armillaria mellea*: *R.A.M.*, 34, p. 366] in citrus orchards in California consists in fumigating with carbon disulphide not only between (2 oz.) but under the trees ($\frac{1}{2}$ to $\frac{3}{4}$ oz.). On 55 mature trees thus treated there were no adverse effects and they made a remarkable recovery; some young trees were damaged.

Klotz (L. J.), DeWolfe (T. A.), & Masters (L. C.). **Septoria control trials in Tulare County.**—*Calif. Citrogr.*, 39, 2, p. 52, 1953. [Received 1955.]

In spray trials conducted in 1952–3 at the Department of Plant Pathology, University of California Citrus Experiment Station, for the control of *Septoria* fruit spotting on oranges [*R.A.M.*, 25, p. 66], six copper mixtures were used: home-made Bordeaux 2–2–100 and 2–10–100; home-made zinc-copper-lime 5–2–20–100; copper-zinc chromate (32 per cent. copper, 18 per cent. zinc, 9 per cent. chromium at 1 lb. 11 oz. per 100 gals.); tetra-copper-calcium oxychloride (45 per cent. copper; 1 lb. 2 oz.); and a material containing aluminium-copper-iron (6 per cent. copper; 8 lb. plus $1\frac{1}{2}$ pints light medium spray oil). With all but Bordeaux 2–10–100, S–20 spreader was used (4 oz. per 100). All the copper mixtures and one zinc preparation (2 lb. per 100 gals. plus spreader) effectively protected the fruit.

Cold seems to favour the development of the fungus; on the northern half of unsprayed trees 11 per cent. more affected oranges were found than on the southern half.

Klotz (L. J.). **Dry root rot of Citrus.**—*Calif. Citrogr.*, 39, 9, p. 340, 1954. [Received 1955.]

Dry root rot of citrus [*R.A.M.*, 30, p. 34] is not commonly recognized as a separate disease, as its cause is not yet known and it often occurs with other diseases. The symptoms are confined to the rootstock and main roots, and are characterized in the early stages by a moist, fishy-smelling decay of the bark, which later dries, leaving hard dead wood beneath. The initially small patches may extend to cover most of the main roots. If the crown is attacked the disease often becomes fatal. Symptoms above ground vary with the extent of infection below. Leaves may wilt and dry or drop; there are more dead twigs than normally.

To prevent dry root rot excessive watering should be avoided, nor should water be permitted to stand in contact with the crown; useful also are the precautions suggested against brown root gummosis [*Phytophthora* spp.: loc. cit.; 32, p. 620] the lesions of which are conducive to the early development of dry root rot. In the early stages diseased bark and wood should be removed to $\frac{1}{4}$ to $\frac{1}{2}$ in. beyond the infected area, the wound disinfected with 2 per cent. mercuric cyanide or mercuric chloride in 25 per cent. denatured alcohol in water, and when dry, covered with thick asphalt paint. Girdled and extensively damaged roots should be removed and the wounds disinfected and covered. In advanced stages the whole tree must be eradicated.

Klotz (L. J.) & Roistacher (C. N.). **Volatile chemicals for control of mold decay of Citrus fruits.**—*Calif. Citrogr.*, 39, 8, p. 268, 1954. [Received 1955.]

Nearly 400 volatile chemicals have been examined for the control of the common blue-green mould decay of citrus fruits [*Penicillium italicum* and *P. digitatum*:

R.A.M., 34, pp. 92, 167, 448] at the University of California Citrus Experiment Station since 1953. The vapours from certain small, regulated concentrations of formaldehyde, paraformaldehyde, acetaldehyde, glyoxal, tetraiodoethylene, 1–2–3 trichlorobenzene, methyl borate, and several volatile carbamates inhibited the rate of decay and greatly reduced losses in injured and inoculated citrus fruits. Other chemicals effectively inhibited decay but possessed undesirable features, and it is hoped to improve these compounds in the future.

Lauriol (Mlle F.). **Les traitements chimiques des Penicillium des Agrumes.** [Chemical treatment against *Penicillium* on Citrus.]—*Fruits d'outre mer*, 9, 1, pp. 3–15, 2 figs., 13 graphs, 1954.

The results of the third and final contribution to this series concerning the control of *Penicillium* spp. (*P. digitatum* [and *P. italicum*]) on stored orange and lemon fruits by means of chemicals at the Plant Protection Laboratory, Institute for Colonial Fruits and Citrus, Paris [*R.A.M.*, 32, p. 430], demonstrated that there is little chance of discovering new fungicides wholly active against these organisms. Instead, further work is needed to determine the mode of action of those already known to be fairly effective, i.e. borax and pentabor (sodium pentaborate), thiourea, pyrrolidine [34, p. 92], 2-aminopyridine [loc. cit.], and hexamine combined with ortho-phenylphenate [loc. cit.]. It has already been established that borax is most effective as a 10 per cent. steep maintained at 45° C. Pentabor is used at the same strength but at a minimum temperature of 15° to 17°. The fruit should be steeped in these solutions less than 36 hours after picking, preferably 12 hours afterwards. Lemons should be washed after steeping to remove the residue. None of these measures, however, gives lasting benefit or protects against infection when wounds are sustained after treatment. These may be reduced by careful handling and packing in wrappers whenever possible; anything with which the fruit comes into contact should be disinfected and the stores treated with diphenyl or quaternary ammonium aerosols. Retreatment with borax before prolonged storage in metropolitan areas is advisable, when an incubation period of five to six days before treatment must be provided for [cf. next abstract]. The use of wax emulsions is profitable since they reduced losses from drying-out of the skins after the above treatments by 50 per cent., representing 3 to 6 per cent. of the total citrus tonnage consumed.

Cuillé (J.) & Yvon (Mlle A.). **Influence des traitements chimiques sur la conservation des Agrumes.** [Effects of chemical treatments on the keeping quality of Citrus.]—*Fruits d'outre mer*, 9, 7, pp. 314–318, 1954.

In further experiments on the control of *Penicillium* spp. [*P. italicum* and *P. digitatum*] on citrus fruits during transit and storage [see preceding abstracts] shipments from Algeria and Morocco treated with borax or pentabor [loc. cit.] arrived in Paris with about half the rot sustained by the untreated lots. Fruits steeped again in 10 per cent. pentabor, dried, and dipped in wax emulsion 163 sustained only 30·8 per cent. loss (due to rotting and drying-out) after a further four months' storage (or 5½ months after picking) at 16° to 18° [C.] and 80 per cent. relative humidity, compared with 60 per cent. for those receiving no further treatment. [This paper also appears in *Fruits Prim. Afr. N.*, 24, 261, pp. 419–423, 1954.]

Rossetti (Victoria). **A doença do Limoeiro cravo nos laranjais de São Paulo.** [The rough Lemon disease in the Orange groves of São Paulo.]—*Biológico*, 21, 1, pp. 1–8, 2 figs., 1955. [English summary.]

The symptoms of a disease affecting four- to eight-year-old Pera, Bahianinha, Hamlin, and Piralima orange trees budded on Rangpur lime in São Paulo, Brazil, are

described and compared with those of psorosis, exocortis [cf. *R.A.M.*, 33, p. 535], and shell bark [cf. 32, p. 430], which they resemble in many respects. They include splitting of the bark and the formation of raised scales, 5 to 15 by 10 to 30 mm., mostly originating in the collar region: a gummy exudate suggestive of infection by *Phytophthora* spp., which could not, however, be isolated in pure culture; and stunting. In a four-year-old Pera planting, for instance, the average heights of 50 healthy and 50 diseased trees were 2·59 and 1·96 m., respectively, representing a reduction in growth of 24·3 per cent.

A species of *Phomopsis* and other secondary fungi were isolated from the diseased cortical tissue, but field observations point to the implication of a virus, which remains to be demonstrated by experimental transmission.

Control should be based on propagation by budwood taken exclusively from certified healthy trees of resistant varieties, e.g., Cleopatra mandarin and Caipira orange, and avoidance of the use of only one variety as a stock in the establishment of commercial plantations.

Plant Pathology Division.—*Quart. Progr. Rep. W. Afr. Inst. Oil Palm Res.* 10, pp. 14–15, 1954. [Mimeographed.]

It has been confirmed that anthracnose of oil palm seedlings in the nursery in Nigeria is associated with transplanting shock.

Spraying trials on the effect of copper sprays on anthracnose and freckle (*Cercospora elaeidis*) [*R.A.M.*, 34, p. 147] established that although Bordeaux mixture, carbide Bordeaux, and Burgundy mixture give complete control of freckle, they burn the leaves too severely to be practicable. Perenox caused less burn but gave only 65 per cent. control.

Kovachich (W. G.). **A leaf disease of the Oil Palm (Elaeis guineensis) caused by Helminthosporium halodes Drechsler var. elaeicola var. nov.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 422–425, 1 pl., 2 figs., 1954.

Approximately 2 per cent. of the nursery oil palms 25 to 90 cm. high at Elisabetha, Belgian Congo, were seriously affected in January, 1953, by a *Helminthosporium* leaf disease [cf. *R.A.M.*, 31, p. 538], a milder form of which has since been observed at Yaligimba. The syndrome commenced with the appearance of small, pale green spots scattered over either of the two youngest open leaves or the closed 'spear' leaf, enlarging and becoming successively yellow with a central pin-point brown spot, light brown, dark brown and zonate on the upper surface with red-brown centres, and finally oval with the upper surface slightly sunken and the lower surface a paler brown than the upper and measuring from 1·5 by 1 mm. to 5 by 3 mm. The spots were surrounded by chlorotic tissue and they frequently coalesced. With heavy infection large areas of the lamina dried and turned grey-brown, the emerging 'spear' leaves becoming heavily infected before opening.

Olive-brown, elliptical to obclavate, 4- to 12-septate conidia ascribed to *Helminthosporium halodes* var. *elaeicola* n.var. were obtained from recently rotted parts of heavily infected leaves; they measured 33 to 125 μ long and 10 to 18 μ wide, with a protruding basal hilum 2 to 3 μ wide. The fungus grew and sporulated well on malt, potato-dextrose, maize-meal, and palm-leaf extract agars, producing conidia indistinguishable from those of *H. halodes* [15, p. 465]; the new variety differs in the shape of the conidia on the host.

Typical symptoms appeared on the leaves of small palms 50 cm. high painted or sprayed with a concentrated spore suspension on either surface of young leaves, or on old leaves. The old leaves of the small palms were only mildly infected; infection developed only on the distal pinnae of the youngest open leaves of medium-sized palms, and the tallest developed only faint, yellow spotting of the pinnae of the youngest, open leaf. *H. halodes* var. *elaeicola* was reisolated from the diseased

parts. The conidia germinated and produced appressoria within 24 hours of inoculation, germ-tubes being produced from either or both terminal cells.

Dell (W.). **De aantasting van de Oliepalm op Sumatra door Ganoderma lucidum.** [The infection of the Oil Palm in Sumatra by *Ganoderma lucidum*.]—*Bergcultures*, 24, 8, pp. 191–195, 197, 199, 201, 203, 1 fig., 3 diags., 1955. [English and Indonesian summaries.]

This is a further study on the stem rot of oil palms caused by *Ganoderma lucidum* along the east coast of Sumatra, a report on the alarming post-war extension of which has already appeared [*R.A.M.*, 34, p. 450]. Infection is most prevalent in older plantings, the percentages of diseased and dead palms in those of 26 and 14 years in December, 1953, being 22·3 and 6·7, respectively. The abnormally high sodium and magnesium contents of low-lying soils reduces the vitality of the palms and enhances their susceptibility to stem rot. Other causes of weakening include an unfavourable soil structure, e.g., in clayey, impermeable ground of marine origin, and a high level of subsoil water preventing deep penetration of the roots; the presence of sheet-lalang [? *Imperata arundinacea*], an after-effect of the interplanting of native crops during the war; repeated floods, especially in ill-drained areas; and neglect of cultural measures, such as weeding, manuring, thinning-out, and provision of drainage.

Among the direct control methods already instituted may be mentioned regular and frequent destruction of the sporophores of the fungus throughout the plantations; cutting down severely infected or dying trees as near soil-level as possible; burning or burying of felled palms to obviate proliferation of the pathogen in the dead stems; treatment of newly infected palms with a 5 per cent. mixture of coal tar and carbolineum; and injection of cryptonol (98 per cent. ortho-oxyquinoline sulphate) into the stems. Cultural practices (besides those indicated above) designed to ameliorate the growth conditions of the palms and increase their vitality should include improvement of the chemical and physical structure of the soil by planting leguminous cover-crops, and avoidance of injuries. Replanting is probably the most effective measure in severely diseased plantations, but if interplanting is practised intensive supervision is essential to prevent infection of the young palms.

Wickens (G. M.), Macdonald (D.), & Manning (H. L.). **Plant Pathology. Plant Breeding.**—*Progr. Rep. Exp. Stas Emp. Cott. Gr. Corp. 1953–4*, pp. 25–35, 1954.

In this report from the Cotton Research Station, Namulonge, Uganda [cf. *R.A.M.*, 32, p. 374; 33, p. 229] it is stated that in variety trials carried out in co-operation with the Government Plant Pathologist seed was inoculated with pure cultures of *Xanthomonas malvacearum* [see above, p. 628], with special measures to provide equal application of inoculum and equalization of any natural infection present. SR 1218 and SR 1221 give evidence of high resistance, as determined by leaf and stem lesions, and BP 52/6 and C (51) 19 of susceptibility in all recordings, but SR 1243, for example, occupied a middle position for the first two records (made at 35 to 39 and 53 days) though it had the highest susceptibility in the last (77 to 83 days); BP 52·5 MB, on the other hand, appeared more resistant at the last count than the earlier records suggested. No single record for this experiment can, therefore, be considered as a reliable expression of the relative susceptibility of the strains to the disease in general.

Seed for the other part of the experiment was dressed with equal applications of granosan by a standardized method. At the 'six weeks' stage there were 38 more or less severely infected seedlings in a total of about 12,000. The affected plants were rogued and thereafter the incidence of leaf and stem infections was very low.

Later, however, there was an appreciable attack of bacterial boll disease. Staining of picked seed cotton was preponderantly due to *X. malvacearum*, and figures for the percentage of stain may be taken as a reasonably accurate index of relative incidence of the boll disease. The strains that gave appreciably higher yields in the seed-dressed part of the experiment than in the seed-inoculated included some apparently resistant strains. SR 1218, highly resistant to main stem attack, and C (50) 20, susceptible, both conspicuously failed to give a higher yield response to seed protection. Moreover, these apparent anomalies were not resolved by the data for incidence of boll attack. It is apparent that differential response to *X. malvacearum* is highly complex, involving other factors than inherent tissue resistance of leaf, stem, or boll.

The development of severe infection in all its phases in eight-weeks-old SUS 7/2 plants after one leaf spray inoculation was in strong contrast to the very light incidence in all phases, except the boll, in the adjoining unsprayed rows. It is clearly characteristic of local conditions that plant to plant spread of all disease phases except that affecting the boll is remarkably limited. Needle-prick inoculations of stems and branches in some instances induced vascular infections.

In breeding work against *X. malvacearum* 127 selfed single plant selections and 19 bulks of Albar 51, selected the previous season, were stem-inoculated by needle-prick. Of the 127 progenies, 48 were homozygous for resistance to the stem phase of the disease, while in another 21, only one plant per progeny was discarded.

A preliminary attempt was made to compare boll resistance in Albar 51/474, homozygous for stem resistance, with that of a BP 52 bulk homozygous for stem susceptibility. Infection of two-day-old bolls was secured by atomizing daily a bacterial suspension into the calyx cup. Before boll opening 95 per cent. of the surviving bolls of BP 52 bore lesions, but only 32 per cent. in the Albar bulk.

Other inoculation experiments showed that no progenies of BP 52 are homozygous for stem resistance, but the percentage of resistant plants in many progenies (up to 90 per cent. in some instances) was much higher than in the previous season; 145 single plant selections covering a range of good characters in addition to stem resistance were carried forward.

When F_1 progenies of crosses between Albar 51 selections and a number of MU 8×BP 52^2 strains were grown and backcrossed, the MU 8×BP 52^2 progenies became severely affected, whereas those of the F_1 produced a heavy crop of clean cotton.

King (H. E.). **Studies of bacterial blight and seed disinfection.**—*Progr. Rep. Exp. Stas Emp. Cott. Gr. Corp. 1953–4*, pp. 8–10, 1955.

Seed disinfection trials against bacterial blight (*Xanthomonas malvacearum*) of cotton [see preceding abstract] in northern Nigeria in 1953–4 showed that organic mercury compounds in some cases markedly reduced visible infection on seedlings and young plants; this relative freedom from symptoms persisted for much of the season. The protection afforded was demonstrated statistically to be associated with increased yield in one experiment.

It seems probable that the value of routine treatment of cotton seed will depend on seasonal and local conditions. On balance, the prospect that seed disinfection may prove economic seems to be good, and continued trials are strongly indicated. The cost, with a battery of hand churns dressing 37 tons, is estimated at barely 1*s.* per acre. It would require an additional yield of only 3 lb. of seed cotton per acre to make the process profitable.

Insects and diseases take nearly 3 million bales of Cotton in '52.—*Nat. agric. Chem. Ass. News*, II, 5, p. 6, 1953.

During 1952, the estimated total reduction in cotton yield from diseases in

Arizona, New Mexico, Texas, Oklahoma, Missouri, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Tennessee, South Carolina, and North Carolina was 1,966,303 bales. Insects and diseases together caused an estimated loss of nearly 3,000,000 bales, out of a total yield estimated at 15,038,000 bales.

Lamas C. (J. M.) & Bazán de Segura (Consuelo). **Experimentos sobre control de la 'chupadera fungosa' del Algodonero en el Valle de Carabayllo (Chillon).** [Experiments on control of the 'fungal damping-off' of Cotton in the Valley of Carabayllo (Chillon).]—*Inf. Estac. agríc. 'La Molina'* 89, 26 pp., 9 figs., 1 graph, 1954. [English summary. Mimeographed.]

Damping-off of cotton, caused by *Rhizoctonia* [*Corticium*] *solani*, is stated to be one of the most serious problems in the coastal valleys of Peru [*R.A.M.*, 15, p. 18], including Carabayllo, and field experiments to determine the possibilities of control were accordingly undertaken during the growing seasons of 1952–3 and 1953–4. A significant reduction in the incidence of infection was obtained by seed treatment with a solution of 75 per cent. Mathieson 275 at a dosage of 185 gm. per 100 lb. seed, corresponding to 138 gm. pentachloronitrobenzene technical product, which may also be used with satisfactory results as a dust at 75, 50, or 20 per cent. In initial trials on an industrial scale the use of Mathieson 275 at the rate of 300 gm. per 100 lb. seed resulted in 95 per cent. control of damping-off.

Granosan 'M' and spergon failed to confer adequate protection, and a number of other fungicides tested proved to be ineffectual.

Toumanoff (C.) & Grison (P.). **Études préliminaires sur l'utilisation des bactéries et champignons entomophages contre les insectes nuisibles.** [Preliminary studies on the use of entomogenous bacteria and fungi against insect pests.]—*C. R. Acad. Agric. Fr.*, 40, 7, pp. 277–280, 1954.

Tests at the Central Station for Agricultural Zoology, France, in 1949 and 1950, of *Beauveria globulifera* [*R.A.M.*, 31, p. 313] and *Metarrhizium anisopliae* [25, p. 161] for the biological control of a number of destructive insects were generally inconclusive. A kill of 58 per cent. was secured in the open air with caterpillars of *Hyponomeutes* on apple by *B. globulifera*. Strain P3 of *Bacillus cereus* [32, p. 153], applied at emergence, killed 28 per cent. of *Gnorimoschema operculella* larvae on potato within ten days of treatment, as against 79 per cent. mortality after treatment with H.C.H. insecticide. *Pieris* caterpillars in three stages were all killed, *Malacosoma* showed 90 per cent. dead, and *G. operculella* 83 to 100 per cent. Preparations of *B. cereus* var. *alesti* containing 20,000,000 spores per ml., with 5 per cent. dextrin wetter killed between 70 and 100 per cent. of *Pieris*, *Malacosoma*, and *G. operculella* caterpillars.

At temperatures between 16° and 32° C. the effect of the bacillus on *Pieris* was complete and swift, the time for kill slowing down above and below this to three to five days. With increasing age more caterpillars survived for longer periods, those in the stage immediately before pupation living up to five days. Two days after application in the field the efficacy of a bacterial culture, to which 2 per cent. bentonite had been added, was still complete on larvae of the first stage (100 per cent. kill within four days) but it had ceased a week later; caterpillars of the third stage were slowed down and their pupation delayed by five days.

Vago (C.) & Gingast (C.). **Effets prophylactiques et thérapeutiques de l'accumulation par capillarité foliaire du sulfate neutre d'oxyquinoléine dans l'aliment du Ver à soie.** [Prophylactic and therapeutic effects of the accumulation by foliar capillarity of neutral oxyquinoline sulphate in the food of the Silkworm.]—*C. R. Acad. Agric. Fr.*, 40, 18, pp. 709–711, 1954.

In experiments conducted at the Sericultural Research Station, Alès, France,

several thousand silkworms were inoculated with conidia of *Beauveria bassiana* [*R.A.M.*, 32, p. 557]. By the time of cocoon-formation 76 per cent. of these were infected. A part of this lot, which had received 24 meals of leaves dipped into a 0·1 per cent. solution of neutral oxyquinoline sulphate in a breeding-ground treated with the same solution, showed signs of infection in only 39 per cent. The chemical is harmless to the insects, which readily accept it despite its smell.

Wolcott (G. N.). **Entomogenous fungi in Puerto Rico.**—*Science*, 121, 3155, pp. 875–876, 1 fig., 1955.

Excessive rainfall on Puerto Rico due to a hurricane in October, 1954, resulted in an unusual outbreak of entomogenous fungi though these were not observed in localities with the heaviest rainfall. On the seagrape (*Coccoloba uvifera*), larvae of the sawfly, *Sericocera krugii*, which does not seem to have been attacked before by entomogenous fungi, were found on half-eaten leaves, all killed by *Beauveria bassiana* [cf. preceding abstract], the chitin-covered head alone being free from the fungus.

Mass destruction of heavy infestations of the guava whitefly (*Metaleurodicus minimus*) by *Aschersonia* spp. [*R.A.M.*, 29, p. 302] was reported from the Isabela Sub-station early in December. Also in December a heavy infestation of *Coccus viridis* on citrus leaves was thickly covered with *Aschersonia goldiana*, and mass infestations of *Myzus persicae* on wild mustard (*Brassica integrifolia*) had been destroyed by *Acrostalagmus* [*Verticillium*] *aphidum* [21, p. 77]. Material collected later [on aphids] at Orocovis was identified as *Empusa aphidis* [31, p. 634].

DeWolfe (T. A.), Klotz (L. J.), Baines (R. C.), & Moore (P. W.). **Nematode-capturing fungi.**—*Calif. Citrogr.*, 39, 3, p. 104, 3 figs., 1954. [Received 1955.]

Two nematode-capturing fungi, *Arthrobotrys oligospora* [cf. *R.A.M.*, 33, p. 352] and *A. dactyloides*, were found in a shavings mulch applied experimentally in a citrus grove in California. Among the nematodes devoured was the citrus nematode *Tylenchulus semipenetrans* [31, p. 543]. Investigations into the cultural practices favouring these fungi, with a view to systematic biological control, are in progress.

Venkataram (C. S.). **Variation in the cultural characteristics of Fusarium lini.**—*Phytopathology*, 45, 4, p. 240, 1955.

At the Department of Plant Pathology and Botany, University of Minnesota, an isolate of *Fusarium lini* of the 'wild type' *sensu* Miller [cf. *R.A.M.*, 24, p. 351] developed a sporodochial form in one out of 120 monoconidial third-generation subcultures, whilst 119 produced the 'wild' form. Both 'wild' and sporodochial lines retained their characteristics in six subsequent generations. Mutation in culture is thought to have been responsible for the development of the sporodochial variant [cf. 31, p. 493].

s'Jacob (J. C.). **Research on the susceptibility of Flax to Flax rust (Melampsora lini).**—*Euphytica*, 4, 2, pp. 107–115, 3 figs., 1955. [Dutch summary.]

In 1953 De Miranda, working at the Institute for Phytopathological Research, Wageningen, with the differentials used by Flor to determine flax rust (*Melampsora lini*) races [*R.A.M.*, 33, p. 424], found eight races (V, V^1, W, Y, R, P, Bo, and Z) in flax collections from different parts of the Netherlands [29, p. 495] and nine flax varieties carrying genes for resistance to all these races, viz., Ottawa 770 B (resistance gene L), Kenya (L4), Koto (N6), Leona (N3), Birio (L6), Cass (M3), Polk (N5), Dakota (M), and Wilden (L5). Leona sustained infection type 2 with many races, i.e., it possesses the main gene for resistance but few minor genes, and should not be used in breeding work. In the tabulated reactions of the differentials Bombay

is classed as resistant to all races except P and BO. which evoke a susceptible reaction on the stem only, differing entirely from Flor's description of the reaction types.

Several flax varieties from the Institute for Research on Varieties of Field Crops (I.V.R.O.) and the Netherlands Flax Institute were tested as young plants for resistance to each separate race except R; Corvallis, 806 3, and Cascade were resistant to all seven. Minor genes appeared to have a great influence on reaction, and there seemed to be little correlation between the presence of resistance genes and the amount of firing. This was borne out in practice as there was little correlation between rust severity on the leaves and the amount of firing on the straw in the field. After reviewing methods for testing rust resistance in flax, in particular 'rust gardens', the author states that in a field trial in 1953 Corvallis, 806 3, and Cascade suddenly suffered rather severe infection one month after field inoculation, but a fortnight later when the plants were in flower the affected leaves had dropped and no new pustules had appeared. In all other field tests they remained entirely resistant.

ARIF (A. G.). **A study of physiologic specialization of the Flax rust, Melampsora lini.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 353–361, 1954.

Thirty-eight collections of *Melampsora lini* from flax crops in Northern Ireland, England, Scotland, Wales, and Pakistan [*R.A.M.*, 33, p. 424] yielded 17 physiologic races distinguished on 17 differential varieties. They included nine new races designated by the letters A to J. J was similar to New Zealand race 9 [32, p. 80]. There were no differences in reaction when seedlings were inoculated at 10 or 30 days. All the races except G and J occurred in Northern Ireland. Race G occurred only in a Pakistan crop and J in England. The other race isolated from English crops was H. The only culture obtained from Scotland belonged to race 1 (Flor). Three cultures from Welsh crops were referred to 1, 25, and D. Race 25, isolated eight times, was the most common and widely distributed; 1 and C were isolated four times; 4, 29, and H three times, D and E twice, and the rest once only.

In the greenhouse all the fibre varieties commonly grown in the United Kingdom, viz. Danish 40, Linkopis, Liral Prince, Liral Dominion, Liral Crown, Liral Monarch, Stormont Motley, and U.S.S.R. No. 1 (ex Shakhunskaya) were susceptible to all the races isolated. Formosa, Hollandia, and Punjab (type 15) were resistant to or immune from all except G. Certain other imported varieties including Winnona, Textilschchik, Stakhanovets, Wada, 1288 12, and U.S.S.R. No. 2 (ex Dugejheshchya) were immune from or highly resistant to all the races [cf. 28, p. 288]. Varieties susceptible in greenhouse tests were also susceptible in the field before flowering, but were resistant after flowering.

BALD (J. G.), KOFRANEK (A. M.), & LUNT (O. R.). **Leaf scorch and Rhizoctonia on Croft Lilies.**—*Phytopathology*, 45, 3, pp. 156–162, 1 fig., 1955.

In an experiment at the University of California, Los Angeles, on the influence of nutrition on leaf scorch of Croft lilies [*R.A.M.*, 32, p. 379], which has become a serious problem in greenhouse forcing in the State during the last decade, root injury associated with *Rhizoctonia* [*Corticium*] *solani* [11, p. 243] was assessed and compared with the incidence of foliar damage at various nutrient levels. Nitrogen and calcium levels, and to a lesser extent soil pH, affected both leaf scorch and root rot, but the reaction of the former to the various treatments was complicated by a group of factors, including the storage conditions of the bulbs prior to planting. Both high nitrogen and high calcium significantly reduced the number of necrotic lesions on the leaves.

A calculation of partial correlations demonstrated a close connexion between the severity of leaf scorch and root damage, the latter being also directly associated

with blasting of buds in the excess nitrogen series of tests. Heavy applications of nitrogen reduced the incidence of leaf scorch and increased that of bud blast.

C. solani was responsible for stunting of the plants and a decline in the number of buds. Simultaneous control of the fungus and leaf scorch was accomplished by immersion for 30 or 45 minutes in a mixture of $\frac{1}{4}$ pint lysol and 2 oz. fermate in 6 gals. water; success was also obtained when infected leaf scales were held for 45 minutes in the solution or 15 minutes under a vacuum at about 25 m. of mercury, all treated bulbils remaining free from *C. solani*. It would appear from these and more recent observations that leaf scorch is related to root injury by *C. solani* and possibly other incitants, e.g., nematodes. Hence control by correct fertilizing would be a suppression of symptoms rather than elimination of the basic cause.

Holmes (F. O.). **Elimination of spotted wilt from Dahlias by propagation of tip cuttings.**—*Phytopathology*, 45, 4, pp. 224–226, 1 fig., 1955.

A clone of the Rhythm variety of dahlia (*Dahlia pinnata*), all plants of which were severely infected by tomato spotted wilt virus in New Jersey [in 1946: *R.A.M.*, 28, p. 90], was transformed into a healthy stock of plants by the rooting of small stem-tip cuttings. The same method was also successfully applied to other varieties, including Pink Giant and Mab. The virus evidently does not move readily towards the growing tips but lags behind stem development. Recovered stocks remained healthy when grown at a distance from a source of reinfection.

Occurrence of Phoma chrysanthemicola Hollos on imported Chrysanthemum seedlings.—*Plant Prot. Bull., New Delhi*, 5, 1, p. 31, 1953.

This information on *Phoma chrysanthemicola* on chrysanthemum seedlings from Holland has already been noticed from another source [*R.A.M.*, 33, p. 28].

Diseases of Antirrhinum.—*Tasm. J. Agric.*, 24, 4, pp. 366–369, 3 figs., 1953.

Notes are given on the principal diseases of antirrhinum in Tasmania [cf. *R.A.M.*, 33, p. 29]. Damping-off [cf. 23, p. 178; 30, p. 134], caused by various fungi including *Phytophthora* spp. and *Thielavia basicola* [cf. 5, p. 392], is best controlled by soil sterilization with steam, formalin, or chloropicrin. Drainage material and seed boxes should also be sterilized. Seed treatment with spergon or thiram by shaking and then dusting off the surplus material through muslin is also recommended. Against stem rot, usually caused by *Phytophthora cryptogea* [6, p. 669], similar methods are effective in the greenhouse; in the field, crop rotation, excluding cinerarias, Iceland poppies [*Papavar nudicaule*], tomatoes, stocks [*Matthiola* spp.], petunias, *Tagetes*, and tulips, all of which are susceptible, is very important. In established plantations diseased plants together with adhering soil should be removed and the area drenched with Cheshunt compound. Downy mildew [*Peronospora antirrhini*: 33, p. 209], affecting predominantly young seedlings, is controlled by protective sprays of 3–2–40 Bordeaux mixture or half-strength copper oxychloride at 10-day intervals until planting out. Similar methods are recommended against shothole (*Heteropatella antirrhini*) [25, p. 330], the most serious and widespread antirrhinum disease in Tasmania; spraying, however, should be continued after planting out. Non-parasitic dry stem, the flower stem drying out six inches back from the tip, with failure to produce seed was observed in commercial plantings in 1948, particularly in poorly drained soil.

Scakamuzzi (G.). **Control of Carnation rust with fungicides in Italy.**—*F.A.O. Pl. Prot. Bull.*, 3, 3, pp. 41–42, 1954.

A full account is given of the control of carnation rust (*Uromyces caryophyllinus*) [*U. dianthi*] in Italy by spraying with dithane Z–78 [*R.A.M.*, 33, pp. 425, 437]; in the present paper the concentration used is given as 0·3 per cent.

Hellmers (E.). **Bacterial leaf spot of African Marigold (Tagetes erecta) caused by Pseudomonas tagetis sp.n.**—*Acta Agric. scand.*, 5. 2–3. pp. 185–200. 4 figs., 1955.

In June, 1952, specimens of Yellow Supreme *Tagetes erecta* plants were submitted for examination to the Department of Plant Pathology of the Royal Veterinary and Agricultural College, Copenhagen. The leaves were misshapen and covered by brownish to nearly jet-black, irregular, often elongated spots of varying size, imparting a frost-bitten or scorched appearance. The material originated in four different localities, one in south Jutland and three near Copenhagen, and the disease is stated to have been certainly present in Denmark since 1937 and probably earlier, though apparently unknown elsewhere.

The bacterium isolated from infected leaf tissue did not agree with any previously published descriptions, and is accordingly named *Pseudomonas tagetis* n.sp. It is rod-shaped with rounded ends, measuring 1·5 to 3·1 by 0·5 to 0·9 μ, occurring singly or in pairs and forming in liquid media chains of seven to ten elements, non-spore-forming, uni- to biflagellate, furnished with a thin, slimy capsule, and Gram-negative but staining readily with methylene blue and carbol fuchsin. The colonies on nutrient agar are pulvinate, circular, with a somewhat irregularly crenate margin, pale grey, glistening, semi-transparent, and finely granular. The minimum, optimum, and maximum temperatures for growth are 1° to 2°, 27° to 28°, and 33° to 35° C., with a thermal inactivation point at 49°. Gelatin is liquefied, litmus milk peptonized without reduction of litmus, and acid but no gas evolved from xylose, fructose, glucose, galactose, mannose, saccharose, raffinose, and glycerol in synthetic media. Starch is not hydrolysed, indole and hydrogen sulphide are not formed, nitrates are not reduced, and the Voges-Proskauer and methyl red tests are negative.

Inoculation experiments gave positive results on Yellow Supreme and Gold Supreme *T. erecta*, but four varieties of *T. patula* remained immune.

The principal source of infection is contaminated seed. Control consists primarily in the production of healthy seed from carefully selected plants. Mild outbreaks, however, may be checked by wide spacing of the plants and maintenance of dry conditions, while some protection against further spread is afforded by spraying with 0·1 per cent. mercusan or 0·75 per cent. midol-special-mercuri.

Arx (J. A. v.) & de Leeuw (W. P.). **Een schimmelziekte op Achillea ptarmica L.** [A fungous disease on *Achillea ptarmica* L.]—*Tijdschr. PlZiekt.*, 60. 6, pp. 251–252, 3 figs., 1954. [German summary.]

In 1954 the popular ornamental Perry's White *Achillea ptarmica* var. *multiplex* was attacked in four nurseries near Leiden, Holland, by *Schizothyrioma ptarmicae* (DC.) v. Hohn. (*Ann. mycol., Berl.*, 15. pp. 293–385. 1917), hitherto encountered only on the wild form of the host. Stems, leaves, and inflorescences are involved, the asci (each containing only two ascospores) being formed between the cuticle and epidermis of the last-named organs and maturing on the living plant. Diseased plants are not killed but fail to attain their full growth and present an unsightly appearance. The pathogen is probably transmitted through the seed.

Langdon (R. F. N.). **New species of Claviceps.**—*Pap. Dep. Bot. Univ. Qd* (formerly *Pap. Dep. Biol. Univ. Qd*), 3, 4, pp. 39–40, 1954.

Three new species of *Claviceps* are described. *C. sulcata* was found on *Brachiaria* spp. from Southern Rhodesia, South Africa, and Uganda; *C. cynodontis* on *Cynodon dactylon* from South Africa, the Gold Coast, India, and Nyasaland; and *C. queenslandica* on *Paspalum orbiculare* in South Queensland.

Graham (J. H.). **Helminthosporium leaf streak of Timothy.**—*Phytopathology*, 45, 4, pp. 227–228, 1 fig., 1955.

A hitherto undescribed disease of *Phleum pratense*, characterized by irregular, light brown, necrotic, often marginal streaks, 1 to 5 mm. wide, with conspicuous chlorotic borders, sometimes extending the entire length of the blade, has been observed since 1950 in central Pennsylvania and more recently in other north-eastern States. Coalescence of the lesions culminates in browning of most of the leaf. In some cases the streaks are narrow and chlorosis is absent, tending to cause confusion with brown stripe (*Scolecotrichum graminis*); under moist conditions, however, leaves attacked by this fungus bear distinctive rows of dark conidiophore tufts. The agent of the leaf streak was identified as a new variety, var. *phlei*, of *Helminthosporium dictyoides*, originally described by Drechsler [*R.A.M.*, 3, p. 65], differing from the type on meadow fescue [*Festuca pratensis*] in the larger dimensions (38 to 118 by 10 to 18, usually 72 to 88 by 12 to 15 μ) of its conidia, which are furnished with two to seven, usually four to five septa; production of secondary conidia, ranging from 22 by 12 μ, with two to three septa, to 93 by 14 μ with four; and host reaction. On potato dextrose agar the fungus gives rise to dense, raised, pale to iron-grey colonies, the optimum temperature for mycelial growth lying between 25° and 28° C. In cross-inoculation experiments with *H. dictyoides* and the new variety, the former attacked only *F. pratensis* while the latter was restricted to *P. pratense*.

Offutt (M. S.). **Inoculation studies as related to breeding for resistance to bacterial wilt in Lespedeza.**—*Diss. Abstr.*, 15, 1, p. 7, 1955.

Bacterial wilt (*Xanthomonas lespedezae*) is the most destructive disease of annual *Lespedeza* in Missouri [*R.A.M.*, 33, p. 301] particularly Korean *Lespedeza* (*L. stipulacea*). Studies at the University of Missouri demonstrated that the bacterium enters through wounds and spreads rapidly within the xylem, more particularly in susceptible strains. The number of susceptible plants becoming infected naturally is probably less than 3 per cent. Hulls from stored seed and stems and debris from diseased plants left in the field during the winter still harboured virulent bacteria the following April. There were three possible means of secondary spread in the field, all involving injury to the host.

A measure of resistance [loc. cit.] was secured by determining the yield reduction from wilt on a percentage basis. Losses following field inoculation ranged from 5 per cent. in the most resistant strains to about 50 per cent. in the most susceptible. Forage quality was lower in the latter owing to more severe stunting and a higher percentage of fallen leaves. All the strains tested were more susceptible to wilt under winter light conditions than those of spring and summer. Foliage inoculation led to a higher degree of infection than root inoculation.

Lamberts (H.). **Broadening the bases for the breeding of Yellow Sweet Lupine.**—*Euphytica*, 4, 2, pp. 97–106, 2 figs., 1955. [Dutch summary.]

In the section on breeding for resistance to various diseases in yellow lupin [*Lupinus luteus*] it is reported that powdery mildew (*Erysiphe polygoni*) may cause losses of up to 50 per cent. [in the field] or more in the greenhouse in Holland. All the F_1 progeny from the crosses with the resistant line W. H. 20 [*R.A.M.*, 34, p. 94] were likewise resistant, while in the F_2 they segregated in the ratio of three resistant : one susceptible. In greenhouse trials at Wageningen the resistance appeared to last for the entire growing period, a monogenous dominance of the favourable character being established. The resistance gene is designated *Er*. A long moist period in 1953 caused regrowth and the resistant plants were slightly attacked.

Damage from wilt (*Fusarium oxysporum* f. *lupini*) can be very serious, as the disease spreads rapidly, rendering a field unfit for lupin-growing for several years.

Attacks have increased considerably of late: a good crop rotation can check their occurrence. The initial symptoms appear at a soil temperature of about 15° C. Resistance was first found in 1950 [30, p. 613], when Portuguese material yielded 23 lines, some of which remained completely healthy while others were partly attacked. Young plants are tested for resistance by growing them in Wisconsin tanks at a water temperature of about 21° after inoculation. All F_2 susceptibles from resistant × susceptible crosses are attacked about a month later, segregating into approximately three resistant: one susceptible. At a temperature of 25° the segregation was quite different and at 29° all the plants were attacked. Further experiments with a greater number of trial fields established that at least three physiologic races (designated Physio 1, 2, and 3) are involved. The lines may be divided into four groups with respect to resistance, B147/53 being resistant to all three races.

Mosaic [virus: 29, p. 415] can be checked by early sowing, the use of seed obtained from healthy fields, and field selection. The degree of seed transmission [25, p. 68] depends on the stage of development at which initial symptoms appear. No plants were free from mosaic under conditions favourable to its development, but some lines derived from the Dutch land race have so far been attacked only after flowering. Seed transmission has not been established in this type and the yield reduction is unimportant.

Putt (E. D.) & Sackston (W. E.). **Rust resistance in Sunflowers (Helianthus annuus L.).**—*Nature, Lond.*, 176, 4471, p. 77, 1955.

The area devoted to sunflowers for edible oil in Canada, all in southern Manitoba, was reduced from 60,000 acres in 1949 to 3,500 in 1952, largely owing to rust (*Puccinia helianthi*). The results are presented of a co-operative investigation of resistance conducted at Morden and Winnipeg [*R.A.M.*, 33, p. 591]. To date three sources of resistance have been recognized, the first being found in 1949 in an F_2 plant from the natural cross Sunrise × Texas Wild Annual in a field nursery. Seedlings from selfed seed were resistant in greenhouse inoculations and F_1 populations from a cross between field-grown plants from these (pollen parent) and rust-susceptible inbred lines of commercial agronomic type included plants that were only lightly infected in the field in 1951, the year of severest rust outbreak ever recorded in Canada. From later generations 133 lines selected on the basis of agronomic type averaged only 9·6 per cent. rust in the field compared with an average of 26·9 per cent. in susceptible material. From these lines 320 plants with 5 per cent. rust or less were selfed and the seedlings inoculated in the greenhouse with three different single-pustule isolates of *P. helianthi*; 70 per cent. showed resistance. Twenty-six progeny were interpollinated in isolation to produce the recently licensed rust-resistant variety Beacon. Several inbred lines from the same source have had uniformly low rust infections, sometimes less than 1 per cent. when susceptible controls have had 10 to 90 per cent.

The second source of resistance was a large plant discovered in 1951 in the F_3 progeny of the natural cross California Oilseed × Texas Wild Annual. When 11 seedlings from open-pollinated seed were inoculated with the three above-mentioned rust isolates, six were resistant. Seed of 58 selfed plants of the same progeny yielded two outstanding lines in the field in 1952; of 30 plants in these lines 11 were rust-free and 15 only slightly affected. Several other lines also contained rust-free plants while the controls had 20 to 80 per cent. infection. Of 21 progenies from these lines ten were resistant in all inoculations; derivations from them continued to show high field-resistance in later generations. Sunflowers with the same parentage have also proved resistant in the field in Peru and Argentina.

The third source of resistance was a plant from seed of open-pollinated plants of the variety Hopi observed to have low rust infection in a field plot in 1952. The

second selfed generation tested in the greenhouse with a field collection of rust contained 25 resistant seedlings. Of 11 third-generation selfed progenies grown in the field, each with eight to 15 plants, one had 1 per cent. rust or less on all plants, two 2 per cent. or less, and seven 5 per cent. or less, while adjacent susceptible plants had up to 90 per cent. infection.

Food investigation.—*Rep. Dep. sci. industr. Res. Lond., 1953–1954*, pp. 39–47, 1955.

In the section on fruit and vegetables it is reported that lenticel rotting (*Gloeosporium* species) [*R.A.M.*, 34, p. 157] of Cox's Orange Pippin apples held in storage beyond Christmas has become serious in England in recent years. The losses suffered by growers in 1953 were higher than in 1952 and as high as in 1951, and make long storage increasingly unprofitable.

Inoculation experiments have shown that Cox's Orange twigs are infected more rapidly than Bramley's seedling. Cankers caused by inoculation in May produced viable spores of *Gloeosporium* [*Neofabraea*] *perennans* [loc. cit.] from June throughout the remainder of the growing season and the following winter. Fruit from badly cankered trees suffered considerably more rotting in storage than fruit from trees without visible cankers. Spraying trees in the late summer appears to decrease rotting.

Investigation of the causes of superficial scald of apples [34, p. 39] is complicated by seasonal variations in skin injury, but it has been established that exceptionally fine summers (e.g., 1947 and 1949) are more likely to produce susceptible fruit than normal summers; large size [34, p. 528] and early picking also favour the disorder and the latter conduces to skin injury. Scald on early-picked apples can be prevented by wrapping the fruit in oiled paper; with late-picked apples, however, wrapping often produces skin lesions. Stagnancy of air in the store increases the risk of injury, and certain volatile chemicals, particularly ethylene [33, p. 608], produced by the fruit during storage seem to have some influence on the development of scald. Ethylene usually increases in the atmosphere up to about the 75th day of storage, after which it can be removed by ventilation as quickly as it forms; if so, the apples remain relatively free from injury. If, however, the concentration of ethylene continues to increase throughout the period of storage, scald is serious.

Stewart (N.). **Powdery mildew of Apples.**—*Gdnrs' Chron.*, Ser. 3, 138, 3576, pp. 34–35, 1 fig., 1955.

Apple powdery mildew (*Podosphaera leucotricha*) has increased considerably in recent years and is regarded as one of the major diseases of most apple varieties in England [*R.A.M.*, 33, p. 238]. Root stocks M[alling] I and M. XVI are susceptible and may transmit the infection to the scion variety; mildewed sucker shoots of quince may be a source of infection for apples. Infection and control [loc. cit.] are discussed.

Dye (D. W.). **Preliminary field trials to control blast of stone fruit (Pseudomonas syringae van Hall.).**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 4, pp. 331–334, 1 col. fig., 1954.

In field trials, carried out in mid and late winter and early spring, 1953, at the Plant Diseases Division, Auckland, New Zealand, Black Boy peach seedlings and Stark one-year-old trees were wounded, sprayed with four therapeutants, and inoculated, when dry, with a broth culture of a pathogenic strain of *Pseudomonas syringae*. Streptomycin sulphate (180 p.p.m.) [*R.A.M.*, 34, p. 159] was highly protective in all three trials, reducing the number of positive lesions in the three tests from 127, 199, and 299 on those treated with water to 28, 35, and 59, respectively. Bordeaux mixture (6–8–100) and flit 406 (50 per cent. captan at 2 lb. per 100 gals.) both reduced infection slightly in two trials, and dithane Z–78 (3 lb.)

gave inconsistent results. More infection was present on the plants treated when spring growth had commenced than when they were still apparently dormant.

Klos (E. J.). **Ring spot and yellows of Cherry : orchard spread, injurious effects on the trees, symptom expression on different varieties, and influence of tree nutrition and light on disease development.**—*Diss. Abstr.*, 15, 1, pp. 6–7, 1955.

Surveys in a Montmorency cherry orchard [in New York State] demonstrated that the ring spot virus [*R.A.M.*, 32, p. 199; 34, p. 378] spread rapidly, frequently followed by yellows [loc. cit.; 32, p. 367] in the same or later years. Neither virus showed any definite pattern of spread. Symptoms produced by artificial inoculations with several virus sources showed a close relationship between sweet cherry lace leaf [32, p. 199] and sour cherry ring spot. Field plot experiments and leaf anatomy studies indicated that yellows and ring spot travel in the phloem or phloem-related tissues. Bud inoculations in mid-September gave better results than spring graft inoculations except for those made in the trunk. Symptom expression was enhanced by moderate or heavy pruning at the time of inoculation. In most cases the leaf spot fungus (*Coccomyces hiemalis*) infected leaves of trees containing ring spot or yellows more severely than those on healthy trees. In a controlled nutrient experiment Montmorency trees inoculated with yellows showed no etch as the ring spot trees did, but developed strong rosette and had a high mortality rate.

Mulder (D.). **De overbrenging van een virusziekte van zure Kers op Komkommer.** [The transmission of a virus disease from sour Cherry to Cucumber.]—*Tijdschr. PlZiekt.*, 60, 6, pp. 265–266, 2 figs., 1955. [English summary.]

At the Phytopathological Research Institute, Wageningen, Holland, cucumber seedlings were infected with a virus (probably [cherry] necrotic ring spot [*R.A.M.*, 34, p. 378]) by mechanical inoculation of the cotyledons with sap from young May sour cherry leaves showing 'shock' effects. The symptoms on cucumber comprised necrosis of the growing point, yellow spotting of the foliage, and rosette formation, and thus resembled those induced by Moore *et al.* in the same host by inoculation with a mixture of the necrotic ring spot and [cherry] yellows viruses [28, p. 223].

McManus (G. A.) & Kenworthy (A. L.). **Prevention of potassium deficiency in Montmorency Cherry trees with potassium solutions applied at planting time.** —*Quart. Bull. Mich. agric. Exp. Sta.*, 36, 1, pp. 11–12, 1953.

Potassium deficiency in young Montmorency cherry trees [*R.A.M.*, 30, p. 421] grown in potassium deficient soil near Traverse City, Michigan, was prevented by treating the trees at planting time with a solution of potassium chloride (2 lb. to 100 gals.). The treated trees did not show potassium deficiency symptoms and made better growth than the untreated.

Sygdomme og skadedyr på Hindbaer. [Diseases and pests of Raspberry.]—*Med. Forsøgsv. Plantek. Kbh.* 437, 4 pp., 3 figs., 1955.

Popular notes are given on the occurrence on raspberries in Denmark of *Didymella applanata*; some 20 viroses [*R.A.M.*, 30, p. 601], of which the most important are mosaic, leaf curl (carried in a symptomless form by Lloyd George), yellow blotch-curl [cf. 32, p. 388], and curly dwarf [cf. 29, p. 315]; and foliar chlorosis, prevalent on calcareous soils and remediable by the incorporation of manganese and iron sulphates at the rate of 50 to 100 and 300 to 500 kg. per ha., respectively, the compounds being best applied separately as sprays (200 gm. per 100 l. water).

Stewart (N.). **Hardy fruit garden. Strawberry mildew.**—*Gdnrs' Chron.*, Ser. 3, 138, 3576, p. 33, 1955.

Strawberry mildew [*Sphaerotheca humuli*] is reported to be severe in many planta-

tions in England [*R.A.M.*, 31, p. 246], the fruits being distorted and drying up before ripening. The quality of the fruit is severely affected even by late attacks, which vary with different varieties, the fruit of Royal Sovereign, for example, being less susceptible than the foliage. Spraying or dusting with a sulphur compound gives good control. Burning over the established plantations of fruiting plants where straw is used for mulching is recommended.

Braak (J. P.). **Effect of some environmental factors on the appearance of 'June yellows' in Strawberries and its significance for the development of a test method.**—*Euphytica*, 4, 2, pp. 189–196, 1 graph, 1955. [Dutch summary.]

In experiments at the Institute of Horticultural Plant Breeding, Wageningen, Holland, apparently normal plants of the strawberry varieties Auchincruive and Blakemore developed the 'transient yellows' and 'streak' symptoms of June yellows [*R.A.M.*, 34, p. 604] when grown at 5° C. in about 7,000 lux artificial light for at least 12 hours per day. The maximum effect was observed in about two months in plants grown at a relatively low temperature, and in three months in plants grown at a relatively high one. This method should prove useful for detecting plants that carry latent (inactive) yellows.

Rishbeth (J.). **Fusarium wilt of Bananas in Jamaica. I. Some observations on the epidemiology of the disease.**—*Ann. Bot., Lond.*, N.S., 19, 75, pp. 293–328, 2 pl., 3 figs., 5 graphs, 1955.

This is a full account of work in connexion with the West Indian Banana Research Scheme, Jamaica, on Panama disease (*Fusarium oxysporum* f. *cubense*) some of which has already been reported [*R.A.M.*, 33, p. 213]. The paper deals with the nomenclature, occurrence and host range of the pathogen; the early stages of infection and further progress of the disease and its development in the plantation; dispersal; and the saprophytic phase. The presence of the pathogen in soil can be detected by growing susceptible suckers. In plantations new infections arise both spontaneously and by association with pre-existing ones.

Initial infection often occurs through rootlets; the pathogen apparently cannot penetrate the cortex of main roots except through the vascular strand of rootlets, at least in well-aerated soils. Infection does not occur through dead roots.

F. oxysporum f. *cubense* survives for a relatively short period in infected plant material, owing to rapid decay, but it survives for many years in the soil.

Small plants of *Heliconia psittacorum* were infected with inoculum adequate to infect Gros Michel suckers. Some of these plants were given weekly applications of ammonium sulphate and eight weeks later four in ten of these had rhizome infections; *F. oxysporum* f. *cubense* was recovered, and an isolate proved pathogenic to Gros Michel.

F. oxysporum f. *cubense* may be indigenous to the Caribbean area. When disease-free suckers were planted in a heavy forest in Central America, remote from habitation, 75 per cent. of the bananas developed wilt within two years. *F. oxysporum* f. *cubense* occurs in the soil of certain Gros Michel plantations where no crown symptoms of the disease are observed: hence the pathogen could in the past have been widely dispersed before its presence was suspected. There is a striking increase in the population of the fungus a few months after wilt appears and a decline after infected plants are removed.

Spontaneous cases of wilt first appeared six months after planting, and the rate of appearance reached a maximum two to four months later, after which it declined. Associated cases reached a much higher peak ten months after their first appearance, after which their rate of appearance equally declined. The same trend was observed in five other experimental plantations, established on sites of plantations destroyed by wilt many years before.

Brun (J.). **La 'fausse mosaïque' du Bananier.** [False mosaic of Banana.]—*Fruits d'outre mer*, 9, 4, pp. 168–169, 1 fig., 1954.

'False mosaic' of banana was first observed near Benty, French Guinea, in November, 1952. The first severe manifestations occurred in spring, 1953, and in less than a year the condition was widespread throughout the territory. It is most severe in lower and middle Guinea and least so in the Mamou area. It has also been observed in the Ivory Coast, but up to the present has not caused severe damage, and has been present in Trinidad [*R.A.M.*, 13, p. 455] and Surinam [13, p. 787] for some years. It is characterized by numerous purplish-brown, later black, dashes or short streaks on the leaves parallel to the secondary veins. When the tissue withers the streaks turn yellowish-orange, giving a mosaic effect. In severe cases the whole leaf turns a tobacco brown shade and withers completely from the edges, otherwise the lesions are very sparse and the leaf develops normally. When the flowers appear during a severe attack few functional leaves remain at harvest and the fruits are unfit for marketing owing to their small size and poor ripening; sometimes whole bunches break off. The disease appears to be caused by one or several species of *Hormodendrum* [cf. 23, p. 428 and above, p. 633], a study of which may appear at a later date.

Preliminary studies indicate that the disease attacks chiefly young transplants, particularly at the beginning and end of the wet season. In middle Guinea it is suggested that treatments should be given about mid-June, the beginning of July, and mid-July, and four from about mid-September to mid-November. Copper salts were effective in preliminary trials at the Central Station. A three-month survey of 70 plantations indicated that some, sprinkler-irrigated for several years, have suffered very little damage, whereas others, trench-irrigated, were severely affected.

Champion (J.). **La culture bananière aux Antilles et en Amérique centrale. II. La culture bananière en Jamaïque.** [The Banana industry in the West Indies and Central America. II. The Banana industry in Jamaica.]—*Fruits d'outre mer*, 9, 11, pp. 473–488, 23 figs., 2 graphs, 3 maps, 1954.

The author describes, with the aid of the literature, the present economic position of the Jamaican banana industry, the history of its development, special methods of cultivation and situation of plantations, organization of the industry from planting to exportation of fruit, varieties grown and their reaction to disease, fertilization, and the incidence, history, and control of the principal diseases, Panama disease (*Fusarium* [*oxysporum* var.] *cubense* [see above, p. 655]) and Sigatoka disease or *Cercospora* leaf spot [*Mycosphaerella musicola*: *R.A.M.*, 30, p. 525; 33, p. 590]. The Gros Michel variety is less susceptible to the latter than those of the *Musa sinensis* group.

Brun (J.) & Champion (J.). **Le 'bleu' du Bananier en Guinée française.** ['Blue disease' of the Banana in French Guinea.]—*Fruits d'outre mer*, 8, 6, pp. 266–269, 1 fig., 1 graph, 1953.

Further experiments carried out at the Institute for Colonial Fruits and Citrus from December, 1951, to March, 1953, confirmed that blue disease of bananas in French Guinea is associated with magnesium deficiency [*R.A.M.*, 33, p. 243 and next abstract] and demonstrated the effectiveness of magnesium in any form, but chiefly as dolomite, in reducing its incidence. A cure was effected on a seriously affected planting by distributing 1 kg. per plant; until further studies are completed it is advisable not to exceed this rate. In an experiment in the vicinity of Kindia on very sandy soil 30 gm. per plant of magnesium oxide prevented the development of the disorder. The importance of combining magnesium with potassium fertilizers is indicated.

Moity (M.). **La carence en zinc sur le Bananier.** [Zinc deficiency in Banana.]—*Fruits d'outre mer*, 9, 8, p. 354, 1954.

Stunting of the plants and chlorosis, deformity, dwarfing, and chlorotic spotting of the leaves, typical of zinc deficiency, developed on dwarf bananas in French Guinea grown under controlled conditions in soil limed with excess dolomite to correct any magnesium deficiency [see preceding abstract] when zinc was omitted from the fertilizer. Similar symptoms hitherto ascribed to physiological disturbances or to virus diseases must be considered as those of zinc deficiency in the *sinensis* group of bananas. The condition was corrected after two weeks by spraying the plants with a 2 per cent. neutral zinc solution. Entirely chlorotic leaves took rather longer to turn green. Normal stem development and the production of healthy green leaves resulted from watering the trees with 25 gm. non-neutralized zinc sulphate in two buckets of water.

Daudin (J.). **Épistillage des régimes de Bananes sur pied.** [Depistillation of Banana bunches on the stalk.]—*Fruits d'outre mer*, 8, 10, pp. 488–489, 4 figs., 1953.

It is claimed that removal by hand of the pistil, stamens, and remains of the perianth from banana fruits eight to eleven days after bunch formation helps to reduce losses caused by cigar end rot (*Stachylidium* [*Verticillium*] *theobromae*) [? in French Equatorial Africa, cf. *R.A.M.*, 33, p. 363].

Brun (J.). **La pourriture des Bananes au Cameroun français.** [Rotting of Bananas in the French Cameroons.]—*Fruits d'outre mer*, 9, 7, pp. 311–313, 3 figs., 1954.

Rotting of bananas occurs sporadically and relatively mildly in the M'Banga, Djungo, and Nyombé regions of the French Cameroons. In the Penja and Loum-Chantiers regions it attacks certain plantings very severely between the end of October and mid-December, the disease disappearing almost completely from April to September and the period of maximum infection, approximately 15th July to 15th September, corresponding with that of maximum rainfall. In the Lala area, where the disease is most severe, the infection period is more prolonged. Plants at high altitudes suffer the greatest damage, particularly when they adjoin a forest or plantings of coffee or cacao. Humidity appears to be an important factor. The disease is connected with various organisms, including *Stachylidium* [*Verticillium*] *theobromae* [see preceding abstract], but the main one appears to be *Trachysphaera fructigena* [see above p. 633].

Control should be directed towards producing a minimum of fruit in affected plantings during the period of fungus development, either by cutting down the plants in June, leaving only those bearing fruit and the October-flowering suckers, or by layering to avoid flower production from July to September. These practices, which are being tested, can only be performed in areas where the disease is localized and confined to certain times of the year, so that non-production during three months will not interfere with the regular banana shipments. Chemical control will not be practicable until more is known of the biology of the pathogen.

Cuillé (J.) & Guyot (H.). **Les traitements fongicides des bananeraies. Utilisation des appareils de traitements en bananeraie.** [Fungicidal treatment of Banana plantations. Use of apparatus in the Banana plantation.]—*Fruits d'outre mer*, 9, 7, pp. 269–288, 13 figs., 1 diag., 3 graphs, 1954.

The following theories apply to the mechanical spraying of crops against diseases. According to Brooks (*Agric. Engng, St Joseph, Mich.*, 28, pp. 233–239, 1947), the distance traversed by various sizes of droplets falling from a height of 3·5 m. and carried by a wind velocity of 4·5 km. per hour is: 5 μ diameter, 5,000 m.; 10 μ, 1,480 m.; 33 μ, 135 m.; 50 μ, 58 m.; 80 μ, 23 m.; 170 μ, 7 m.; and 500 μ, 2·25 m. Potts (*J. econ. Ent.*, 39, pp. 716–720, 1947) demonstrated that the finer the particles, the

greater is the coverage on the treated surface; thus, for 11 l. spray per ha. the numbers of droplets deposited per sq. mm. are 1,780 at 10 μ in diameter, 222 (20 μ), 14·3 (50 μ), 1·79 (100 μ), and 0·014 (500 μ). Hence fungicidal sprays should be composed of droplets as fine as possible, although the finer the spray the greater the drift.

Nine experiments were conducted in Guadeloupe to test these theories in connexion with the control of *Cercospora* [*Mycosphaerella musicola*] on banana [*R.A.M.*, 34. p. 467 and following abstracts], viz. sprays applied at low and high pressure, mist sprays with heavy droplets (100 to 200 μ) at low and high pressure, fine mists (50 to 100 μ), dusts, combined fine mist and dust, fogging (droplets, 5 to 60 μ), and vapour treatment.

The results indicated that oil mist applications, perhaps incorporating a dust, would be the most suitable for the climate of the French Antilles. In the above tests this treatment was applied with a Platz Supermoleculator. The mist produced was similar to that from a micron sprayer; the dust, combined with gas oil substance, blended perfectly in the mixture. There was no apparent phytotoxicity. Most of the droplets ranged from 35 to 50 μ in diameter. A distance of 40 m. from the applicator appeared to be a good maximum range in a banana plantation. The mixture persisted well in spite of subsequent rainfall. The preliminary results of a field experiment to compare the efficiency of a fine mist, applied with a Minimicron apparatus, and fogging with a Swingfog apparatus were 68 per cent. healthy leaves with the former, 52 per cent. with the latter, and 36 per cent. or less for the untreated controls. The results of numerous other experiments are awaited.

Guyot (H.) & Cuillé (J.). **Les formules fongicides huileuses pour le traitement des bananeraies.** [Oil fungicide formulations for the treatment of Banana plantations.]—*Fruits d'outre mer*, 9, 7, pp. 289–292, 3 figs., 1954.

Experiments on the control of banana leaf spot (*Cercospora*) [*Mycosphaerella musicola*] in Guadeloupe [*R.A.M.*, 34, p. 467 and preceding and following abstracts] indicated that although the application of fungicides in mineral oil is in its infancy it is particularly efficient and suitable for this crop and climate. Of necessity these formulations require a low-volume apparatus; the normal aqueous mixtures, if applied from such machines, would evaporate before reaching the foliage to be protected. Phytotoxicity is no problem with oil sprays and they cost less than aqueous sprays.

Guyot (H.). **La lutte contre Cercospora musae dans les bananeraies de Guadeloupe. Essais de nébulisation (fogging).** [The control of *Cercospora musae* in Guadeloupe Banana plantations. Fogging trials.]—*Fruits d'outre mer*, 9, 7, pp. 293–296, 6 figs., 1 graph, 1954.

Further observations of the banana plots fog-sprayed with oil-fungicide mixtures in Guadeloupe during 1953 for the control of leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: see preceding and next abstracts] revealed that all the plantings, however treated, appeared in February, 1954, to suffer an equal degree of attack, but the suckers from plants that had been fog-sprayed were more vigorous than the others. Zineb-treated plots yielded a greater number of export quality bunches, which weighed more than the untreated.

A further experiment was conducted from October, 1953, to February, 1954, at the Neufchâteau Station, 247 m. above sea-level, on three trial plots. One (*a*) received a thermo-aerosol oil-fungicide spray on 19th November and 29th December, (*b*) was untreated, and (*c*) sprayed from a knapsack sprayer every 15 days with an aqueous zineb-oxychloride solution. The degree of attack on plots (*b*) and (*c*) entirely nullified the expense of preparing and manuring the soil. Due to favourable timing the two aerosol treatments in (*a*) gave satisfactory control of *M. musi-*

cola, but generally more would be necessary. Ecological studies are required so that warning stations can be set up for each of the four main banana-growing areas to avoid unnecessary spraying.

MERNY (G.). **Essai de nébulisation et de pulvérisation pneumatique dans la lutte contre Cercospora musae à la Guadeloupe.** [Experiment on fogging and pneumatic spraying in the control of *Cercospora musae* in Guadeloupe.]—*Fruits d'outre mer*, 9, 7, pp. 297–301, 1 fig., 1954.

Further studies in Guadeloupe on the control of banana leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: see preceding abstracts] were concerned with a comparison of the efficacy of a fog spray composed of 6 kg. copper oxychloride (50 per cent. metallic copper), 10 l. engine oil, 10 l. gas oil, and 2 l. white oil and a pneumatic spray with 10 kg. copper oxychloride, 250 l. water, and 2 l. wetter, applied both up and down wind. Deposition was measured on fragments of filter paper suspended in the plantation at heights varying from 0·75 m. to 1·5 m. and 10, 20, 30, and 40 m. from the path of the machines. The wind was fairly light, varying from north-east to south-east, and reaching a force of 0·7 to 1·2 m. per second in gusts.

At distances greater than 10 m. the copper deposits in the case of pneumatic spraying were very slight, whether applied up or down wind. This is attributed to the wind-breaking action of the banana plants. A stream of air sufficient to carry the spray 20 m. from the machine would flatten the nearest plants. Fog-spraying gave a far smaller deposit at 10 m. than pneumatic spraying but was satisfactory at this distance when the material was applied down-wind, considering that a deposit of 5 γ metallic copper per sq. cm. is necessary for efficient control. In general the deposits obtained with fog-spraying were finer than those secured with pneumatic spraying, but the latter has the advantage that it can be used effectively against a normal air-current.

SÉCHET (M.). **Quelques parasites des cultures fruitières observés à Madagascar.** [Some parasites of fruit crops observed in Madagascar.]—*Fruits d'outre mer*, 8, 6, pp. 270–272, 5 figs., 1953.

All the following diseases occur on cultivated trees in the vicinity of Tananarive, Madagascar, at 1,300 m. above sea-level. Mango leaves bear small, irregular, necrotic spots, the affected areas of the blades becoming shrunken, withered, and fissured. In a moist chamber pycnidia appeared with five-celled spores measuring 18·5 to 27·7 by 5 to 6·3 (average 22·8 by 6·2) μ, characteristic of *Pestalotia*. One week later the same leaves developed yellowish, fleshy, neckless, non-paraphysate perithecia 150 to 200 μ long and 100 to 200 μ in diameter, enclosing numerous elongated, cylindrical asci 80 to 95 by 6 to 7 μ and containing eight sub-hyaline or slightly fuliginous, tricellular, slightly curved ascospores 7 to 12 by 3 to 6 μ. This appears to be an undescribed species of *Calonectria* for which the name *C. mangiferae* n.sp. is proposed. Its relation to the *Pestalotia* is uncertain. The damage produced is negligible.

Old papaw leaves bear on both surfaces large, whitish, powdery areas near the main veins and chlorotic patches appear. Although the average length of the oidia is 37 (19·5 to 54·9) μ the pathogen is considered to be identical with *Oidium caricae* [*R.A.M.*, 27, p. 483], the oidia of which average 28 μ long. In severe attacks necrosis may occur.

Loquat is attacked by the imperfect state only of *Fabraea maculata*, hitherto apparently confined to New Zealand [26, p. 330], Brazil [26, p. 219], and Cape Province. Preventive spraying with Bordeaux mixture plus 1 per cent. casein during shoot formation is recommended. Another disease, attacking nursery plants only, is characterized by elliptical, greyish white lesions with violaceous margins,

generally elongated along the large secondary veins and often delimited by them on one side, sometimes several cm. in diameter and numerous on one leaf. The centres of the lesions yield short, brown, septate conidiophores 4 μ in diameter and fuliginous, obclavate, beaked conidia, measuring on an average 57 to 98 by 11·4 to 18·6 (average 73 by 15·3) μ; the beaks are 17·4 to 50·8 (30·1) μ, and there are 5 to 10 transverse septa. The name *Alternaria eriobotryae* n.sp. is proposed. As the leaves may be completely destroyed the use of Bordeaux mixture is tentatively suggested. [No Latin diagnoses are provided.]

The Avocado Institute.—*Calif. Citrogr.*, 39, 2, p. 61–63, 1953. [Received 1955.]

At the 25th annual conference of the Avocado Institute, held at La Habra, California, in 1953, J. M. Wallace reported new information concerning seed transmission of the sun-blotch virus [*R.A.M.*, 33, p. 243] obtained in the last two years. In one instance a high percentage of sun-blotched trees were developed from healthy scions on rootstocks derived from symptomless seedlings obtained from seed of a Mexican tree without symptoms. This indicates a carrier.

Halma (F. F.) & Zentmyer (G. A.). **Relative susceptibility of Avocado varieties to Dothiorella rot.**—*Calif. Citrogr.*, 39, 4, pp. 134–135, 2 figs., 1954. [Received 1955.]

Botryosphaeria ribis attacks the trunks and branches of certain avocado varieties in California [*R.A.M.*, 33, p. 243]. Infection usually originates at the bud union, whence it spreads upwards and downwards in Guatemalan, but upwards only in Mexican rootstocks. The hybrid varieties Fuerte and Rincon, the former certainly and the latter probably being between Guatemalan and Mexican stock, have so far remained unaffected. Inoculation experiments are in progress.

L'exposition de défense des cultures à Point-à-Pitre. [The plant protection exhibition at Point-à-Pitre.]—*Fruits d'outre mer*, 9, 7, pp. 319–335, 31 figs., 2 diags., 1954.

The various types of apparatus for protecting fruit crops, demonstrated at the Plant Protection Exhibition held at Point-à-Pitre, Guadeloupe, during March, 1954, namely knapsack, motor, pneumatic, polyvalent, and fog-sprayers and dusting machines, are described briefly and illustrated. The use of aeroplanes is mentioned. Notes are also given on certain fungicides and their uses. It is emphasized that materials and machines must be adapted to local climatic and topographical conditions.

Fungicides.—*J. agric. Food Chem.*, 3, 1, pp. 13–14, 1955.

Commercial development in fungicides in the United States during 1954 centred primarily on new applications of existing products, among which (besides some already noticed in this *Review*) may be mentioned the incorporation of zineb into the soil at planting time to prevent [unspecified] seedling diseases of cotton; the use of Dow's ovotran (parachlorophenyl para-chlorobenzene sulphate), originally introduced for mite extermination on fruit trees, against powdery mildew [*Erysiphe cichoracearum*] of cucumber, melon, and related crops; a new spray formulation of ceresan for the control of snow mould [*Calonectria nivalis*] on wheat; the increasing popularity of karathane [cf. iscothan: *R.A.M.*, 32, p. 558; 33, p. 304], e.g., for the treatment of apple trees against powdery mildew [*Podosphaera leucotricha*], and DuPont's I and D (insect and disease) seed protectant, consisting of arasan and lindane, for use on beans [*Phaseolus vulgaris*]. Stauffer Chemical reports favourable results in tobacco, vegetable, and nursery seed-beds with its sodium *N*-methyl dithiocarbamate fungicide, which is also toxic to nematodes and insects. Applied

as a liquid concentrate during ploughing, it does not require a ground cover as do more volatile materials.

Miller (P. M.). **The effect of certain metabolites and fungicides on Stemphylium spp.**—*Diss. Abstr.*, 15, 1, pp. 19–20, 1955.

In laboratory studies at the University of Illinois *Stemphylium sarciniforme* and *S. solani* gave qualitatively similar but quantitatively different reactions to proprietary fungicides and metabolites [*R.A.M.*, 32, pp. 576, 577; 34, p. 46], taking as a criterion the degree of germ-tube elongation. *S. solani* was generally the more resistant to toxicants and was less susceptible to zineb at 13° C. than *S. sarciniforme*. Short exposures to temperatures above 30° increased the susceptibility of the former to zineb, but freezing for an hour decreased it. Both species generally reacted similarly to zineb-metabolite mixtures. Compounds containing sulphhydryl groups, pepsin, proteinase, trypsinogen, lipase, pectinase, and sodium bisulphite decreased zineb toxicity, whereas sodium thiosulphate increased it as did cozymase and free-based L-arginine sometimes. Free-based L-cysteine and DL-histidine monohydrochloride in water increased ziram toxicity to *S. sarciniforme* only, while free-based L-arginine and sodium thiosulphate increased its toxicity to both species. Fractions from spores or mycelia of one fungus had similar or dissimilar effects on the fungitoxicity of zineb and ziram. Tomato tissue extracts generally decreased fungitoxicity to *S. solani* more than to *S. sarciniforme*.

McNew (G. L.). **The future for fungicides.**—*Agric. Chemic.*, 8, 10, pp. 44–47, 109, 111, 113, 1953.

In his address at the 20th annual meeting of the National Agricultural Chemicals Association, the author reviewed the present position concerning the use of fungicides in the United States, where sulphur, lime-sulphur, and copper compounds are still applied in excess of newer organic compounds. Requirements in the development of a new fungicide [cf. *R.A.M.*, 34, p. 235] include choice of a suitable basic nucleus and arrangement of the toxic grouping to react with a vital constituent of the fungus; the group must be capable of spore penetration, harmless to leaves and fruit, resistant to weathering, and able to be deposited in a thin film. The need for more funds for these basic research problems is emphasized, in view of the heavy annual losses from plant diseases still faced by United States farmers.

Dimond (A. E.). **Progress in plant chemotherapy.**—*Agric. Chemic.*, 8, 12, pp. 34–35, 123, 125, 1953.

In this survey of recent progress in plant chemotherapy with systemic fungicides [*R.A.M.*, 32, p. 437] 22 references are cited, most of which have been noticed in this *Review*.

Lemmon (A. B.). **Regulating sale and use of agricultural pesticides.**—*Calif. Citrogr.*, 39, 4, pp. 128–130, 1954. [Received 1955.]

The laws governing the sale and use of pesticides in California comprise rules and regulations concerning requirements for registration and proper labelling of economic poisons. Registration is considered as a specific acceptance of claims for a particular product; the possible detrimental influence on flavour is taken into consideration. These laws further cover the licensing of agricultural pest control operators (aeroplane pilots), the regulation and use of injurious materials, including the herbicide 2,4-D, and the provision for indication of the time intervals between the application and disappearance of spray residues on produce offered for sale. A list is appended of questions, in addition to those on mere effectiveness, which have to be asked about a chemical before it can be registered and released for general distribution.

Holmes (E.). **Practical plant protection.**—xii+252 pp., 5 pl., London, Constable & Company Ltd., 1955. 15*s*.

The author has spent over 20 years on practical plant protection in the service of larger and better crops. The book is intended as a compendium of effective practices for the grower, rather than as a textbook of academic facts, and technical details as well as scientific names have been reduced to a minimum.

All problems of plant protection are dealt with, including those of methods; formulation of active chemical substances; pests and diseases, subdivided according to types of crops; viruses; deficiency disorders; and the effect of pesticides on beneficial organisms. Detailed advice is given on application methods.

Petersen (S.), Gauss (W.), & Urbschat (E.). **Synthese einfacher Chinon-Derivate mit fungiziden, bakteriostatischen oder cytostatischen Eigenschaften.** [Synthesis of simple quinone derivatives with fungicidal, bacteriostatic, or cytostatic properties.]—*Angew. Chem.*, 67, 8, pp. 217–240, 1955.

In the section of this paper (by E. Urbschat) dealing with the fungicidal uses of quinone derivatives, mention is made of recent developments in their application as seed dressings in the United States under the trade names of phygon and spergon.

At the Biological Institute of the Farbenfabriken Bayer, Leverkusen [near Cologne], Germany, P. E. Frohberger obtained excellent control of damping-off of beet (*Phoma betae* and *Pythium debaryanum*) and of similar conditions [caused by unspecified fungi] in legumes, maize, flax, and cotton by seed treatment with quinonoxim-benzoylhydrazone VII. For instance, the average numbers of healthy beet plants in five tests after five weeks were as follows: untreated 11, quinonoxim-benzoylhydrazone VII at concentrations of 0·1, 0·5, 1, 2·5, and 5 per cent., 70, 116, 107, 142, and 140, respectively, and phenyl mercury acetate (used as a standard of comparison) 100.

Jaenichen (H.) & Heimann (M.). **Untersuchungen über eine Anwendungsmöglichkeit des Ultraschalls in der Phytotherapie (Ultraschallbehandlung zur Abtötung parasitischer Pilze und Bakterien im Innern von Samen, Früchten und Fruchtständen).** [Studies on a potential application of ultra-sound in phytotherapy (ultrasonic treatment for the destruction of parasitic fungi and bacteria in the interior of seeds, fruits, and fructifications).]—*Phytopath. Z.*, 23, 4, pp. 419–462, 9 figs., 4 graphs, 1955.

At the Phytopathological Institute of the Technical College, Hanover, suspensions in twice-distilled water of *Bacterium* [*Corynebacterium*] *michiganense*, isolated from wilted tomato plants, were destroyed by 30 minutes' exposure to an ultra-sound intensity of 18 to 20 W per sq. cm., while the operation of 30 to 40 W for 20 to 30 minutes was necessary to produce comparable results in bouillon cultures. Even more resistant to ultrasonic waves were the conidia of the beet fungi *Phoma betae*, *Cercospora beticola*, *Alternaria* sp., and *Fusarium* sp. Low intensities (2 to 4 W per sq. cm.) and short exposures to higher ones promoted the growth and multiplication of the pathogens *in vitro*. Control of the foregoing organisms in the seeds and fruits of their hosts by ultra-sound alone is considered, on the basis of these experiments, to be impracticable, but promising results were obtained by the application of 6 W per sq. cm. with the addition to the coupling fluid of a suitable disinfectant and growth-promoting substance, e.g., 0·05 per cent. quinosol and 0·0001 per cent. indolyl-3-acetic acid. The combined method was particularly successful with tomatoes, which out-yielded the untreated controls by 29 to 41 per cent.

Bruhin (A.). **Über die polyploidisierende Wirkung eines Samenbeizmittels.** [On the polyploidizing action of a seed dressing.]—*Phytopath. Z.*, 23, 4, pp. 381–394, 12 figs., 2 graphs, 1955.

Immersion of seeds of *Crepis capillaris* in a 0·075 per cent. solution of agrimax M

(phenyl-mercury-dinaphthylmethanedisulphonate) at the Institute for General Botany of the University of Zürich, Switzerland, was followed by inactivation of the spindle apparatus of the mitoses in the root meristem. The cells underwent polyploidy [cf. *R.A.M.*, 18, p. 164; 19, p. 269]. However, agrimax M was evidently less phytotoxic than colchicine, over 50 per cent. of the plants surviving the former treatment as compared with 5 per cent. in the case of the latter. Agrimax M also caused the development of aneuploid cells, in which a paucity of C chromosomes was much more frequent (64·7 per cent.) than that of A (20·6) or D (14·7).

The prescribed concentration of agrimax M (dust), e.g., for wheat seed treatment, is 2 gm. per kg. Assuming that the soil in which the seed is sown contains 1 l. water per kg. the strength of the fungicidal solution would reach 0·2 per cent., or more on the surface of the seed. Even at a lower strength and allowing for partial loss through leaching, the chemical might still be sufficiently potent to exert undesirable effects.

New or uncommon plant diseases and pests in England and Wales.—*Plant Path.*, 3, 4, pp. 138–140, 1 pl. (opp. p. 122), 1954.

J. E. E. Jenkins and M. H. Moore report that during the autumn of 1953 brown rot cankers caused by *Sclerotinia fructigena* severely damaged fruiting spurs and branches on the new apple variety Merton Worcester in an orchard in Essex. Infection probably entered the branches through spurs that bore rotting fruits during the summer.

J. J. Baker found that a sample of prickly spinach seed harvested in 1953 from a crop grown in Lincolnshire from seed produced in Holland was infected by *Colletotrichum spinaciae* [cf. *R.A.M.*, 31, p. 416]. Seeds bearing acervuli invariably gave rise to infected seedlings when germinated on a Copenhagen tank or in pans of sterile soil in a glasshouse. Spores obtained from moist seeds measured 13 to 33 by 3 to 5 (mean for 100 spores 24·8 by 3·5) μ; the setae were up to 220 μ long.

Ciferri (R.). **Manuale di Patologia Vegetale. Tomo I. Tomo II. Seconda Edizione.** [A Manual of Plant Pathology. Volume I. Volume II. Second Edition.]—vi+490 pp., 1 col. pl., 230 figs., 1952. L. 4,000; pp. 491–1213, 409 figs., 1955. L. 6,000. Rome, Società Editrice Dante Alighieri (Albrighi, Segati e C.).

The text of this publication [cf. *R.A.M.*, 25, p. 567], which has the sub-title 'Diseases of Italian cultivated plants', has been completely revised, while almost all the figures are new. The first volume contains parts one to three of the work, dealing, respectively, with general considerations (pp. 1–196) [loc. cit.], non-parasitic diseases (pp. 197–382), and viruses (pp. 383–482). Part four (diseases caused by cryptogamic parasites) makes up the second volume, and is divided into seven sections covering, respectively, diseases caused by bacteria and actinomycetes (pp. 494–559), myxomycetes (pp. 560–569), true fungi (pp. 570–1082), algae (pp. 1083–1085), lichens (pp. 1086–1087), parasitic phanerogams (pp. 1088–1123), and parasitic nematodes (pp. 1124–1143). The alphabetical index fills 56 pages and the list of main headings eight and a half pages. It is hoped to add a third volume later, consisting of coloured plates of fungi.

Naumov (N. A.). Флора грибов Ленинградской области 1. [The fungus flora of the Leningrad region 1.]—182 pp., 102 figs., U.S.S.R. Academy of Sciences Publisher, Moscow–Leningrad, 1954. Roubles 10 kopeks 60.

This book, the first of a series in which an attempt is made to present the complete known fungus flora of the Leningrad region of the U.S.S.R., deals with the Phycomycetes. It is intended to serve as a reference book in practical mycology and to assist in the identification of the fungi found in the region. Twenty-three

families, 70 genera (73 if three not definitely found in the area are included), and 305 (312) species are described, with keys. Indexes are provided to the Latin names of the fungi and hosts.

Parmentier (G.). **Deux méthodes de conservation de souches fongiques.** [Two methods of preserving fungal strains.]—*Parasitica*, 10, 3, pp. 57–59, 1954.

Two methods of preserving fungal cultures against attack by mites, etc., are described. Desiccation in a vacuum is carried out using a vacuum pump with a MacLeod gauge connected to a container of 3·5 l. capacity containing silica gel, the apparatus being so constructed that a vacuum can be created in four glass tubes (about 7 mm. wide by 30 cm. long) simultaneously. A piece of filter-paper 5 mm. by 5 cm. is introduced into each tube, which is then stoppered with cotton-wool and sterilized. A fragment of mycelium from a liquid culture is then placed on the paper under sterile conditions, a constriction being made in the tube between the cotton-wool and the paper. When the tube has cooled, the stopper is pressed tightly against the constriction, and after four to five hours in a vacuum of 0·1 mm. of mercury the tube is sealed off at the constriction without stopping the pump. Kept in this way for five years, *Fusarium avenaceum*, *F. decemcellulare*, *F. solani*, *Verticillium dahliae*, and *Penicillium* sp. remained viable.

Numerous fungi were also grown on a medium with a cellulose base consisting of 30 gm. of mechanical wood pulp, as used for paper-making, 50 mgm. potassium phosphate, 25 mgm. magnesium sulphate, 25 mgm. sodium bicarbonate, 100 mgm. ammonium phosphate, 200 mgm. peptone, and 1 l. water. A year later the fungi were still viable.

Ogawa (J. M.) & English (H.). **The efficiency of a quantitative spore collector using the cyclone method.**—*Phytopathology*, 45, 4, pp. 239–240, 1 fig., 1955.

Using an apparatus adapted from Tervet and Cherry's cyclone separator [*R.A.M.*, 30, p. 114] at the Department of Plant Pathology, University of California, Davis, the relative concentration of *Sclerotinia fructicola* spores in peach orchards was determined in two-hourly periods. The spores were collected either in a flask or on a vaseline-coated cover-slip which replaced the flask at the base of the cyclone. Spores from the flask were transferred to dilution plates containing potato dextrose agar adjusted to pH 2·2 by the addition of citric acid, on which the pathogen had previously been found to grow well, while the growth rate of other species was markedly depressed. In the orchard tests small colonies of various fungi, especially *Cladosporium*, *Alternaria*, and *Penicillium* spp., were found in profusion in the dilution plates, but there was no evidence of *S. fructicola*. A few spores of the last-named, however, were found on the cover-slips, their concentration in the atmosphere of the orchard presumably being so low that their presence was masked by the other fungi. It is suggested that the type of spore collector used may be particularly well adapted to the study of relative spore concentrations of the atmosphere.

Gregory (P. H.). **The construction and use of a portable volumetric spore trap.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 390–404, 2 diags., 1 graph, 1954.

Details are given of the construction and use of a portable, hand-operated form of the Hirst spore trap [*R.A.M.*, 31, p. 618] weighing about 11 lb. It consists of an impactor unit, a constriction or orifice-plate stabilizing the rate of flow, a low vacuum reservoir, a vacuum gauge, and a hand-operated sliding-vane pump, all connected by rubber tubing. Only the middle third of the slide need be made sticky, first with a thin layer of 10 per cent. aqueous 'solvar' and, when dry, with a thickish layer of molten vaseline. Samples of 50 to 100 l. are taken in from five to ten minutes.

The advantages of this trap are that it is light, cheap, and easy to construct and operate. The impactor unit is small and can be placed nearer the ground than the larger automatic trap, while the time of sampling can be determined to within a few seconds. Its disadvantages are that only small samples can be taken at a time, it records for limited periods only, and the spore deposit is more sparse than with the Hirst trap. It is particularly suitable for measuring high spore concentrations, sampling marked concentration gradients, particularly in the first m. above soil-level, and for circumstances requiring a sharp time differentiation.

Lollar (R. M.). **Para-nitrophenol as a fungicide for leather.**—*J. Amer. Leath. Chem. Ass.*, 49, 9, pp. 605–624, 1954.

This survey of the fungicidal uses of paranitrophenol, especially for the control of [unspecified] moulds on leather [*R.A.M.*, 28, p. 583], was prepared at the Department of Basic Science in Tanning Research, University of Cincinnati, Ohio, with the technical assistance of Helen K. Steinle.

It is shown that leather containing a minimum of 0·2 per cent. of the compound will remain mould-free for at least three months in tropical exposure and for ten in damp storage at 35° C. and humidity approaching saturation. Moreover, the presence of paranitrophenol will prevent the loss of grease in re-tan leather, which appears to be consumed by moulds. However, deterioration due to an independent hydrolytic mechanism is still to be expected during storage under humid conditions. Some of the problems incidental to the paranitrophenol treatment of leather are briefly discussed, including the solubility in water and toxicity of the chemical, and its differential application for military and civilian purposes.

Mottern (H. H.). **Cheese keeps longer in antimycotic wrappers.**—*Food Engng*, 54, 10, pp. 93–94, 155, 1 fig., 2 graphs, 1954.

At the Kraft Foods Co. Research Laboratories, Glenview, Illinois, excellent control of [unspecified] moulds on various types of natural and processed cheese [*R.A.M.*, 33, p. 493] has been obtained by the use of parakote wrappers containing 0·3 to 0·4 per cent. dimethyl dichlorosuccinate. In one test, for instance, after 12 weeks' storage at 45° F. the flavour, colour, and appearance of sliced American processed cheese in parakote wrappers were entirely satisfactory and mould incidence was only 1 per cent. compared with 32 on the same product wrapped under identical conditions but without the fungicide. The amount of the latter transferred to the food product is negligible (maximum of 11 p.p.m. in a $\frac{1}{8}$ lb. package), and feeding experiments on rats, e.g., with the addition of 0·1 per cent. to the diet for two years, yielded no evidence of toxicity.

Vasudeva (R. S.) & Chakravarthi (B. P.). **The antibiotic action of Bacillus subtilis in relation to certain parasitic fungi, with special reference to Alternaria solani (Ell. & Mart.) Jones & Grout.**—*Ann. appl. Biol.*, 41, 4, pp. 612–618 1954.

In further studies at the Indian Agricultural Research Institute, New Delhi [*R.A.M.*, 29, p. 624; 31, p. 609], the culture filtrate of *Bacillus subtilis* [33, p. 105] inhibited the growth of *Rhizoctonia* [*Corticium*] *solani*, *R. bataticola* [*Macrophomina phaseoli*], *Colletotrichum falcatum* [*Glomerella tucumanensis*], *Botrytis cinerea* [33, p. 105], *Alternaria solani* [loc. cit.; 34, p. 238], and *Fusarium udum*. The degree of inhibition varied with the different fungi, *A. solani* and *M. phaseoli* being the most sensitive. The antibiotic principle was both fungicidal and fungistatic, and induced a characteristic 'bulb' formation on the spores and germ-tubes of *A. solani*. In experiments on detached potato leaves and potted potato plants the filtrate when added to the spore suspension effectively checked infection by *A. solani*. There was less infection in potato shoots and leaves dipped in the filtrate and later inoculated

with *A. solani* than in those not dipped, indicating that the antibiotic principle is capable of diffusion within the host tissues.

Strzemska (Mme J.). **Zagadnienie mikoryzy u zbóż. Cz. III. Pszenica.** [The problem of mycorrhiza in corn plants. Part III. Wheat.]—*Acta microbiol. polonica*, **2**, 4, pp. 297–306, 10 figs., 1953.

During investigations on the occurrence and development of mycorrhiza in wheat in Poland [cf. *R.A.M.*, **32**, p. 688] 450 root preparations from wheat, *Triticum dicoccum*, *T. durum*, *T. monococcum*, *T. spelta*, and *T. polonicum* were examined. Endotrophic mycorrhiza was found in all of them, being most abundant in the first two. Mycorrhizal development increases with the age of the plants and is independent of the kind of soil and the pH (6–8). Roots not infected with mycorrhiza are irregular in shape with deformed root-cells. Fruiting bodies of the mycorrhizal fungus were observed on one of the root preparations of *T. spelta*.

Sobotka (A.). **Čisté kultury z plodnic mykorrhitických hub.** [Pure cultures from the fruiting bodies of mycorrhizal fungi.]—*Práce výzk. Ust. lesn. ČSR* [*Stud. For. Res. Inst. C.S.R.*], *1954*, 6, pp. 101–123, 28 figs., 1954. [Russian and German summaries.]

Investigations carried out in Czechoslovakia on the culture of mycorrhizal fungi for practical use in forestry showed that pure cultures of *Boletus edulis*, *Amanita muscaria*, *Ixocomus* [*B.*] *elegans*, *Xerocomus* [*B.*] *badius*, *B. luteus*, and *B. variegatus* can be grown from the 'eye' of the fruiting body.

Melin (E.) & Das (V. S. R.). **Influence of root-metabolites on the growth of tree mycorrhizal fungi.**—*Physiol. Plant.*, 7, 4, pp. 851–858, 1 diag., 3 graphs, 1954. [Received August, 1955.]

In further studies on tree mycorrhizal fungi [cf. *R.A.M.*, **33**, p. 371] at the Institute of Physiological Botany, University of Uppsala, Sweden, excised roots of *Lepidium sativum*, lucerne, hemp, and wheat produced metabolites with a growth-promoting influence on cultures of the mycorrhizal fungi *Boletus variegatus* from pine [loc. cit.] and *B. elegans* from larch. Initially, pea roots increased the growth of *Rhizopogon roseolus* from pine [loc. cit.]; this was followed by an inhibitory effect. These growth-promoting substances, designated factor M, are not specific for certain roots and occur in unrelated plants. *B. variegatus* and *R. roseolus* are partially, and *Russula xerampelina* from pine totally deficient for the M factor.

Ashour (W. E.). **Pectinase production by Botrytis cinerea and Pythium debaryanum.**—*Trans. Brit. mycol. Soc.*, **37**, 4, pp. 343–352, 2 graphs, 1954.

In studies at the Faculty of Agriculture, Shebin El Kom, Egypt, growth and enzyme production in a liquid medium by *Botrytis cinerea* [*R.A.M.*, **31**, p. 623] increased with a rise in asparagine concentration. Increased sucrose or glucose resulted in greatly increased growth but a decrease in enzyme production. There was an inverse correlation between mycelial growth and enzyme activity with a high carbon: nitrogen ratio, but there was a direct correlation when the ratio was reduced by higher asparagine concentrations.

Pectinase secretion by *Pythium debaryanum* [loc. cit.] was highest on dilute potato decoctions and a synthetic medium (N) composed of glucose, starch, asparagine, peptone, magnesium sulphate, and potassium phosphate when the reaction was alkaline; the nitrogenous constituents appeared to be more important than the carbohydrates. Pectinase activity varied inversely with the concentrations of magnesium sulphate and potassium phosphate. Pectin favoured pectinase

secretion by *B. cinerea* but with *P. debaryanum* its presence in a medium otherwise suitable for pectinase production was definitely harmful.

TRIBE (H. T.). **Studies in the physiology of parasitism. XIX. On the killing of plant cells by enzymes from Botrytis cinerea and Bacterium aroideae.**—*Ann. Bot., Lond.*, N.S., 19, 75, pp. 351–368, 3 pl., 5 graphs, 1955.

Enzymes from the soft-rot pathogens *Botrytis cinerea* [*R.A.M.*, 34, pp. 162, 472] and Dowson's strain 66 of *Bacterium* [*Erwinia*] *aroideae* [33, p. 18; 34, p. 216], grown in simple synthetic media, decreased the viscosity of pectin and pectate solutions, macerated parenchymatous tissues of higher plants (carrot and potato), and killed cells of the macerated tissues. The three criteria gave parallel estimates of activity.

B. cinerea enzymes were active between pH 3·5 and 6, decreasing to nearly nil at pH 8. *E. aroideae* was most active above pH 8, activity decreasing to nearly nil at pH 5. Both enzymes lost much activity on prolonged dialysis against distilled water; it was not recovered on the readdition of the dialysed salts. Small losses occurred on dialysis against certain salts or salt mixtures.

Plasmolysing concentrations of salts or non-electrolytes retarded the killing action of the enzymes, the effect being out of all proportion to that on maceration or on rate of pectin degradation. Isolated plasmolysed protoplasts from tissues of cucumber and *Sedum spectabile* were as resistant to toxicity as those inside the tissue.

SADASIVAN (T. S.) & SUBRAMANIAN (C. V.). **Studies in the growth requirements of Indian fungi.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 426–430, 1954.

At the University Botany Laboratory, Madras, 26 isolates of fungi from different Indian host plants were tested for vitamin requirements [cf. *R.A.M.*, 28, p. 478]; 15 displayed no deficiency. *Sclerotium oryzae* and *Piricularia oryzae* [33, p. 500] from rice, *P. setariae* from *Setaria italica*, *P. zingiberi* from ginger, three undetermined *P.* spp. from *Eleusine coracana*, wheat, and *Brachiaria*, *Ceratostomella* sp. [29, p. 53] from coco-nut, *Phytophthora arecae* from areca palm, *Pellicularia* [*Corticium*] *koleroga* [32, p. 78] from coffee, and *C. microsclerotia* (culture) were heterotrophic for thiamine but synthesized it from thiazole and pyrimidine or from the latter alone. *Piricularia oryzae* reacted thus only in older cultures. The growth of *C. koleroga* was not inhibited by excessive doses of thiamine and biotin, whereas riboflavin in similar doses depressed growth. All the species of *Piricularia* were biotin-deficient; *S. oryzae* was autotrophic for biotin.

A strain of *Aspergillus niger* isolated from Indian soil was more sensitive in detecting traces of copper and molybdenum than the standard 'M' strain used for bio-assay of heavy metals.

VEZIN (C.). **Vingt années de contrôle officiel des plants de Pommes de terre.** [Twenty years of official control of seed Potatoes.]—*C.R. Acad. Agric. Fr.*, 40, 8, pp. 348–353, 1 graph, 1954.

The author reviews the development, from 1920, of selection in France's annual potato crop, which is second in importance only to wheat, amounting to 13 to 14,000,000 tons from about 1,000,000 ha. and representing a value of Fr. 160 milliards. 'Seed' selection against virus degeneration [*R.A.M.*, 34, p. 515] began with 70 centres inspecting 172 ha. Now there are 139 syndicates. Techniques and the quality of seed grades have much improved since the war.

GOERLITZ (H.). **Verschiedene Pflanzkartoffel-Anbaumethoden, ihre Entwicklung and praktische Bedeutung (I. Teil. II. Teil).** [Various methods of seed Potato

cultivation, their development and practical importance (parts I and II).] *Dtsch. Landw.*, 6, 5, pp. 232–235; 6, pp. 274–281, 3 figs., 1 diag., 1955.

The principles on which the German, Dutch, and Russian methods of seed potato production are based are explained and discussed in the light of 33 contributions to the literature. German material is planted without any special preparation, mostly direct from the clamp, towards the middle of May, or somewhat earlier on light soils. To obviate the risk of virus infection a minimum distance of 20 m. from adjacent diseased stands must be maintained. Roguing of infected plants is carried out two to three times at fixed intervals. Lifting takes place after the withering of the foliage, or rather earlier in hilly regions, and the entire crop is stored immediately to await sorting in the spring.

Specific features of the Dutch method include pre-germination and planting at the earliest possible date, stringent selection by specialists, haulm-pulling about ten days after the onset of the aphid summer flight, followed in a fortnight by lifting [*R.A.M.*, 34, p. 389] and preliminary storage (until the autumn) in small earthern clamps; later in pre-germination boxes in store-houses.

Briefly, the Russian method consists in storage in deep earthen pits, thereby preventing premature exhaustion of the seed through germination; pre-germination by an appropriate technique in June; and planting after black fallow in July to August.

In three years' comparative experiments in the healthy area of Mecklenburg, the German method proved to be the most profitable; the Dutch requires so much more labour that the somewhat larger and superior-quality yields ensured thereby would be lucrative only in the case of valuable material to be used, e.g., in a breeding nursery on the home farm; while the Russian (summer-planting) not only resulted in a relatively high incidence of virus infection but the yield was only about 60 per cent. of the normal [loc. cit.]. In 1951 and 1952 the application of the Dutch method on a sandy soil with an admixture of clay in the degeneration area of Frankfurt (Oder) to healthy seed of eight varieties, namely, Frühbote, Frühnudel, Mittelfrühe, Johanna, Merkur, Voran, Ackersegen, and Capella, reduced the spread of viroses to such an extent that the third-year yield was not inferior to that obtained in Mecklenburg. On humus-clay at Bernburg (Saale), where 'degeneration' also prevails, the beneficial effects of the same practices were not maintained beyond the first year. Summer planting gave poor yields in both areas in 1952 and 1953.

Köhler (E.). **Weitere Beiträge zur Kenntnis des Y-Virus der Kartoffel.** [Further contributions to the knowledge of Potato virus Y.]—*Phytopath. Z.*, 23, 3, pp. 328–334, 2 figs., 1955.

At the Institute for Agricultural Virus Research, Brunswick, Germany, Aquila, Johanna, Heida, Voran, and Ostbote potato leaves were inoculated with a solution of equal parts of water and sap from White Burley tobacco plants infected by strain Go of potato virus Y, using the carborundum abrasion technique. Only a very small proportion of the progeny arising from tubers of the inoculated plants developed virus Y symptoms, and nearly all of those that did so had contracted spontaneous infection by potato leaf-roll virus, which appears to expedite the otherwise tardy movement of virus Y into the tubers.

Using the highly susceptible A6 selection of *Solanum demissum* [*R.A.M.*, 33, p. 172] as a test plant, the inactivation temperature (10 minutes' exposure) for strains GA, Go, DJ, and Al of potato virus Y was about 60° C., while Ca succumbed at 56°.

The above-mentioned particularly virulent strain Al, which is new to Germany, was isolated from tobacco in Oldenburg in 1952. Inoculated in the greenhouse into

the lower leaves of young Samsun tobacco plants, it produced a whitish, necrotic, reticulate pattern along the intercostal veins, accompanied by a downward rolling or curving, while extensive longitudinal necroses appeared on the midribs. On the younger leaves the necroses were replaced by a strongly marked 'pearl pattern'. White Burley tobacco leaves also reacted to the new strain by the formation of necroses, mostly on the midrib. The symptoms on tobacco were closely reminiscent of certain mixed infections with potato virus X as one of the partners and might therefore give rise to confusion.

On *S. demissum* A6 strain A1 induced the development of numerous black, necrotic rings, such as are generally typical of virus Y. The symptoms of infection by A1 are strikingly similar to those described by Nobrega and Silberschmidt from Brazil as vein necrosis and by Bawden and Kassanis as tobacco veinal necrosis [31, p. 201].

PETZER (C. F.). **The control of late blight in Potatoes.**—*Fmg in S. Afr.*, 29, 345, pp. 572, 584, 1954. [Received 1955.]

In this paper, intended primarily for growers, the author describes the biology of and conditions favouring attacks by the potato blight fungus, *Phytophthora infestans*, in South Africa [*R.A.M.*, 33, p. 657], with details of control measures. Recent experiments at Stellenbosch during a severe attack demonstrated the efficiency of Bordeaux mixture, copper oxychloride, and copper oxychloride sulphate sprays and zinc dusts containing 8 per cent. zineb in controlling it. Applications are recommended to begin when the plants are 5 or 6 in. high and to be repeated every seven to ten days.

KEAY (MARGARET A.). **Methods for studying the susceptibility of Potato foliage to Phytophthora infestans.**—*Plant Path.*, 3, 4, pp. 131–132, 1954.

At the Potato Genetics Station, Cambridge, sporangia of *Phytophthora infestans* for inoculations [*R.A.M.*, 34, p. 392] are obtained by growing the fungus on potato leaves [cf. 34, p. 242] in enamel dishes. Specialized strains are grown on leaves of the appropriate differential host. They require subculturing every four to seven days. Stock pedigree cultures are kept on whole tubers stored at 5° C., or on chick-pea agar [33, p. 375]. The inoculum is prepared by dipping sporulating leaves into distilled water.

The seedlings, in seed-boxes, are inoculated late in the afternoon by spraying them with a sporangial suspension by means of an atomizer of the throat-spray type and kept in a humidity chamber for about 15 hours. Next day, the top of the humidity chamber is removed, and late in the afternoon the plants are reinoculated and returned to the humid atmosphere overnight. They are then moved to a shaded part of a glasshouse, and after two to five days symptoms appear. The seedlings are then put back in the humidity chamber; the fungus sporulates on susceptible plants within 24 hours. Susceptible seedlings are destroyed daily. Larger plants are inoculated by means of an aerocide projector (Pan-Britannica Industries, Limited), from which the inoculum is forcibly expelled by means of the compressed gas in a 'sparket bulb'.

For determining the reactions of first-year seedlings to different strains of the fungus, the detached leaflet method is used. Wet cellulose wadding is placed in the bottom of the dish and covered with a sheet of blotting paper. The dish is covered with a piece of surgical gauze kept in position by wetting the part in contact with the rim. The leaflets are placed on the gauze with the lower surface uppermost and sprayed with a sporangial suspension; the dish is then covered with a sheet of glass lined with wet blotting paper. After 24 hours the leaflets are turned over with sterilized forceps. The dishes are stacked in a closed box, if possible

at 16° to 18°. The reactions of the leaflets are determined with the aid of a binocular microscope.

VAN DER ZAAG (D. E.). **Looftrekken of doodspuiten van Aardappelen?** [Pulling or spray-killing of Potato haulms?]—*Tijdschr. PlZiekt.*, 60, 6, pp. 256–258, 1954. [English summary.]

It is customary in Holland to pull the haulms of many varieties of seed potatoes in time to prevent virus transmission by aphids, and during the last few years killing with chemicals has partially replaced pulling by hand. The relative effects of these two practices on the incidence of subsequent tuber infection by *Phytophthora infestans* [*R.A.M.*, 34, p. 242] were investigated at the Agricultural College, Wageningen. In the plots where the haulms were pulled by hand twice as many tubers were diseased as in those where aamorta (sodium arsenite) was applied.

CHATTOPADHYAY (S. B.). **Spraying operations for control of 'late blight' of Potato in the Himalayan hills in Darjeeling district.**—*Plant Prot. Bull., New Delhi*, 5, 2, pp. 33–39, 1953. [Received 1955.]

In spraying trials against potato blight (*Phytophthora infestans* [*R.A.M.*, 32, p. 544] in the Darjeeling district, India, during 1949 to 1952, inclusive, complete control was obtained on the varieties Red Round and White Long with five sprays of dithane Z-78 (2 lb. per 100 gals.) in 1949 and three in 1952, indicating that repeated spraying greatly reduces the disease. An average of four sprays is regarded as necessary and economically justified. Increased yields ranged from 38 to 126 per cent. Total spraying costs were approximately Rs. 48 per acre and the average yield increases realized Rs. 150 per acre.

NORELL (I.). **The effect of ultra-violet light on the resistance of Potato tubers to Fusarium species.**—*Physiol. Plant.*, 7, 4, pp. 797–809, 12 figs., 1954.

In studies at the Institute of Physiological Botany, Uppsala University, Sweden, the resistance of tuber disks of the potato varieties King Edward VII, Bintje, British Queen, and Ackersegen to inoculation with *Fusarium solani* [*R.A.M.*, 31, p. 540], its var. *martii* f. 1 [cf. 29, p. 380], and *F. culmorum* [loc. cit.] was reduced by pre-treatment with ultra-violet irradiation from a Hanau mercury lamp at 40 cm. The normal recovery of potato tissue from the injury due to ultra-violet light was counteracted by the *Fusarium* infection.

Disks of potato tissue infected with *Phytophthora* [*infestans*] exuded more nitrogenous substances than comparable healthy ones.

Potato gangrene, skin necrosis and similar diseases.—*Adv. Leaf. Dep. Agric. Scot.*, N.S., 26, 9 pp., 12 figs., 1953.

Most of the information here presented on potato gangrene (*Phoma foveata*) and the associated skin necrosis [*R.A.M.*, 32, p. 504] has already been noticed in this *Review*. No potato varieties are as yet known to be wholly resistant, but the disease has not been observed on Arran Chief, Conference, Dr. McIntosh, Dunbar Rover, and Up-to-Date. In addition to control measures previously indicated, dipping the boxes in which severely infected tubers had been stored or spraying with a 2 per cent. solution of copper sulphate is recommended. Pit rot, the cause of which is unknown, *Botrytis* rot (*B. cinerea*), and damage due to careless cultivation and storage of the crop may sometimes be confused with gangrene and skin necrosis.

HOFFMANN (G. M.). **Möglichkeiten und Aussichten einer Qualitätssteigerung im Kartoffelbau durch Bekämpfung des Kartoffelschorfes.** [Possibilities and prospects of an improvement of quality in Potato cultivation through Potato scab control.]—*Dtsch. Landw.*, 6, 6, pp. 288–291, 1955.

Under the headings of seed and soil disinfection, manuring and crop rotation, and

breeding for resistance the writer summarizes 45 contributions to the literature on potato scab (*Streptomyces* [*Actinomyces*] *scabies*) control, with special reference to the application of the appropriate measures under German conditions [*R.A.M.*, 34, p. 316].

McKee (R. K.) & Webster (T.). **Galls on Potato sprouts caused by Spongospora subterranea.**—*Plant Path.*, 3, 4, pp. 123–124, 1 pl., 1954.

In November, 1953, 3 cwt. of seed tubers of Home Guard potatoes, grown in Northern Ireland by the National Institute of Agricultural Botany for clonal trials, were put out in chitting trays at Sutton Bonington, Potato Storage Investigation, University of Nottingham. By 15th January, 1954, most of the tubers had sprouted; 11 had sprouts bearing galls caused by *Spongospora subterranea*. All were in upper trays which had been moistened from time to time by a slight penetration of rain through the roof ventilators. Growth of the infected sprouts had been stimulated, and they were much longer than the healthy ones. There was little indication of *S. subterranea* on any of the tubers, and no reports were received of galls on samples of the same stocks sent to other centres or on the bulk lots in Northern Ireland.

The galls consisted of lateral swellings 0·3 to 1·3 cm. wide. The surface was white and smooth at first, with pale purple patches; growth cracks developed, and necrosis of the tissues ensued, spreading inwards from the surface.

Van Herwijnen (A.). **Iets over het bestrijding van kringerigheid bij Aardappelen.** [A little about the control of spraing in Potatoes.]—*Tijdschr. PlZiekt.*, 60, 3, pp. 273–275, 1954. [English summary.]

In three years' field experiments in North Holland, effective control of potato spraing [*R.A.M.*, 32, p. 145], a serious disease under local conditions, was obtained in the Saskia and Duke of York varieties in light, sandy soil by the incorporation of potassium permanganate at the rate of 90 gm. per sq. m. Early treatments (at planting time, e.g., on 29th March) gave better results than applications made at emergence (29th April).

International Rice Commission. Report of the fifth meeting of the working party on Rice breeding, Tokyo, Japan, October, 1954.—*F.A.O. agric. Developm. Pap.* 46, 58 pp., 1954.

In the section of this report [cf. *R.A.M.*, 34, p. 48] headed 'summary of discussions' (pp. 11–52) it is stated that preliminary experiments at the Cuttack Rice Research Institute, India, clearly showed that in rice affected by lodging [cause unspecified] there is a significant loss of crop, largely due to increase in the proportion of chaff to rice. Ridging reduced lodging. In Japan it was found that resistant varieties tended to produce short stems and small, light ears, but the latter disadvantage could be overcome by breeding to increase the number of tillers.

In a report on physiological diseases it was stated that 'mentek' [33, p. 558] in Indonesia is associated with nematode infestation of physiologically abnormal plants. Work in Malaya on 'penyakit merah' and in Pakistan on 'pansukh' [24, p. 471] has begun; it has already been shown that the former is a true physiological disease. In Japan, of four types of 'straight head' [34, p. 317] recognized, two are due to low temperature and to drought, one was confined to land previously under dry cultivation, and the fourth, 'hideri-aodachi', was associated with poorly drained soils high in organic matter. There is as yet insufficient common ground (as between the different countries) on which to base a programme of co-ordinated research into the physiological diseases of rice.

Schure (Miss P. S. J.). **Attempts to control the kresek disease of Rice by chemical treatment of the seedlings.**—*Contr. gen. agric. Res. Sta., Bogor* 136, 17 pp., 3 figs., 1953. [Indonesian summary. Received March, 1954.]

Further studies at the General Agricultural Research Station, Bogor, Indonesia, on the kresek disease of rice [*R.A.M.*, 30, p. 539] have led the author to describe the causal bacterium as a new species, *Xanthomonas kresek*, with rods 0·3–0·45 by 0·7 to 2·4 μ. Gram negative and aerobic. No acid and no gas were produced from dextrose, lactose, maltose, sucrose, glycerol, and mannitol, starch was not hydrolysed, nor were nitrates reduced. Litmus milk was turned alkaline and cleared. On meat infusion glucose agar colonies were citron yellow, smooth, circular, and translucent. Although as yet the disease is not of great economic importance, its control by various treatments of Bengawan rice in concrete boxes was investigated. Young rice seedlings were washed with sterilized rain-water, the leaf-tips cut to make them of uniform length, dipped in a chemotherapeutic substance, then inoculated with *X. kresek*, all prior to transplantation at ages ranging from three to five weeks. The disease was effectively controlled by dipping the seedlings in 0·05 or 0·1 per cent. copper sulphate or 0·05 per cent. copper nitrate prior to inoculation, this treatment giving a disease index of 0 to 1·5 compared with 6·25 to 9·75 in the untreated controls. *In vitro* tests showed that the pathogen is directly inhibited by copper, growth being prevented by 0·01 per cent. copper sulphate and retarded by 0·001 per cent.

Kaimal (K. N.). **Notes on some common diseases of the Rubber tree in South India.**—*Plant. Chron.*, 48, 19, pp. 516–521, 1953.

During a disease survey of rubber trees in South India the following were found to be prevalent. Leaf blight (*Phytophthora meadii*), the most widespread and serious, is favoured by the very humid monsoon weather, but can be controlled by the use of resistant clones, e.g., B.D. 10 (plus a light application of Bordeaux mixture), Glenshiel 1, and AVROS 255, the last two being recommended for small-scale planting; *Oidium heveae* [*R.A.M.*, 33, p. 255] which may be severe under favourable conditions, such as light showers followed by cool, cloudy weather during refoliation; *Helminthosporium heveae*, occurring freely on young plants with a low water supply; *Corticium salmonicolor* [34, p. 544], which is frequently overlooked and its control neglected in consequence; die-back attributed to *Gloeosporium* spp. and *Phyllosticta* spp.; and *Ceratostomella* [*Ceratocystis*] *fimbriata* [32, p. 148], prevalent during the south-west monsoon and controllable by the application of 'Burma paste' or weak izal preparations to the recently tapped bark as a precautionary measure.

Stripe canker and patch canker (species of *Phytophthora* and *Pythium*) and *Ustulina zonata* [31, p. 513] were observed to cause severe damage occasionally.

Ganoderma pseudoferreum [32, p. 337], *Fomes noxius*, and *F. lignosus*, though not yet serious, have been observed in many States in South India.

Wiersum (L. K.). **Hevea aangetast door slijmziekte (Pseudomonas solanacearum Erw. Smith).** [Rubber attacked by slime disease (*Pseudomonas solanacearum* Erw. Smith).]—*Bergcultures*, 24, 10, pp. 244–245, 2 figs., 1955. [English and Indonesian summaries.]

In October, 1954, some 50 cases of slime disease (*Pseudomonas solanacearum*) were observed in a two-year-old *Hevea* rubber planting covering an area of 60 ha. at Bantam, Java. This is stated to be the first report of the pathogen on rubber. The aerial symptoms resembled those of die-back, a sudden foliar discoloration being followed by leaf-shedding and necrosis from the top downwards. Secondary infection by *Diplodia* sp. was nearly always present. Some cases of temporary resumption of growth were noted but none of permanent recovery. The cortex of

the tap-root and stem base was apparently healthy, but the underlying wood was slightly discoloured and the larger wood-vessels, which were more or less occluded by masses of bacteria, presented the appearance of longitudinal dark stripes running along the exposed wood. The bacterium was isolated from the diseased tissues and successfully inoculated into young rubber. Tomato plants also reacted by the typical rapid wilting and death associated with slime disease.

Höhnk (W.). **Niedere Pilze vom Watt und Meeresgrund (Chytridiales und Thraustochytriaceae).** [Lower fungi from tidal areas and the sea bottom (Chytridiales and Thraustochytriaceae).]—*Naturwissenschaften*, 42, 11, pp. 348–349, 1955.

Samples of soil collected from the bottom of the North Sea in February, 1955, and examined for their fungal contents at the Marine Research Institute, Bremerhaven, Germany, yielded almost exclusively Thraustochytriaceae, whereas species of *Rhizophidium*, *Rhizidium*, *Phlyctochytrium*, *Olpidium*, and *Chytridium* predominated in the tidal areas in the estuary of the Weser. Pine pollen was the most effective of the baits tested [cf. *R.A.M.*, 31, p. 142; 34, p. 62]. Some [unspecified] higher fungi also occurred in material from the estuary.

Swartz (Phyllis A.), Webb (R. B.), Cozad (G. C.), & Clark (J. B.). **A continuation of the investigation of the soil microflora of two grassland plots.**—*Proc. Okla Acad. Sci.*, 34 (*1953*), pp. 121–123, 1955.

Further investigations on the soil microflora in Oklahoma [cf. *R.A.M.*, 33, p. 687] during the summer of 1953 revealed a vast reduction in the number of bacteria occurring in the virgin prairie, the ratio when compared to the previous year being 1·2:13. In contrast to the previous year's results the total microbiological activity and number of micro-organisms was much greater in the prairie than in the revegetating field. The fungi in both sites had increased, particularly in the field. The results of these preliminary experiments indicate that the differences in microflora are not due to microbial antagonism.

Spicher (G.). **Untersuchungen über die Wirkung von Erdextrakt und Spurenelementen auf das Wachstum verschiedener Streptomyzeten.** [Studies on the influence of soil extract and trace elements on the growth of various streptomycetes.]—*Zbl. Bakt.*, Abt. 2, 108, 21–22, pp. 579–587, 4 figs., 4 graphs, 1955.

The rate of the acceleration in growth of some strains of soil actinomycetes induced by the addition of soil extract to the nutrient medium, a note on which from the Brunswick branch of the German Biological Institute has already appeared [*R.A.M.*, 34, p. 62], was found to be directly proportional, within certain limits, to the concentration of the supplement. The maximum effect was exerted by an eightfold concentrated compost soil extract added to the same amount of the basic medium. There was no essential difference between the effect of the soil extract and that of the corresponding ash, indicating that the stimulus to growth afforded by the extract resides for the most part in its trace element content. In fact, the addition of iron, magnesium, zinc, copper, or molybdenum to a medium free from trace elements expedited the development of the organisms in a similar manner to the soil extract.

Chinnayya (E. J.) & Agnihothrudu (V.). **Rhizosphere microflora of plants growing in different ecological habitats.**—*J. Madras Univ.*, Sect. B, 23, 2, pp. 182–192, 6 graphs, 1953.

In a study at the University Botany Laboratory, Madras, India, the numbers of fungi, bacteria, and actinomycetes in the rhizosphere of mesophytic plants, determined by the dilution plate method, were found to be higher than those of aquatic and marsh species. Isolations from the roots yielded the greatest variety of fungi

from aquatic plants. The occurrence of specific rhizosphere micro-organisms appeared to depend more on the individual plant species than on the habitat in which they were grown.

PARK (D.). **An indirect method for the study of fungi in the soil.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 405–411, 3 graphs, 1954.

In the Department of Cryptogamic Botany, University of Manchester, a method was evolved for determining the vigour of fungus growth in the substratum, particularly of fungi in soil where the measurement of growth is very difficult. Particles of a selected, untreated soil were placed under sterile conditions on the surface of Czapek-Dox agar in Petri dishes. After incubation for 24 hours at 25° C. the size of each particle and the greatest amount of linear mycelial growth were measured microscopically (converted to mm.). The mycelia giving the greatest growth from soil particles larger than 0·6 mm. were found to belong to the same species. Growth was then compared on other substrata including Brown's 3 per cent. malt extract and tap-water agar media, and soil autoclaved at 121° for 30 minutes, using for inocula either soil particles (spheres) or agar cubes, 0·15 to 8 mm. in size, four per dish. Inoculum diameter was plotted against maximum linear growth after 24 hours. The line drawn through the highest points of the curve was taken as an indication of a maximum potential of the substratum to support the growth of the indicator fungus. For most substrata the static region of this curve was reached at inoculum sizes between 2 and 4 mm. In one instance only was an inoculum of 6·5 mm. needed. Therefore, it may be assumed that the increase in the amount of mycelium produced in 24 hours had ceased at inoculum sizes below 7·5 mm.; for comparison of maximum readings an inoculum about this size was used. It was found that the differences in these maxima for different types and sizes of inocula were due not to differences in growth rate but to differences in the duration of the lag phase, which in turn depended upon the previous vigour of the protoplasm. The steepness of the initial part of the growth curve was a criterion of the density of the mycelium within the substratum.

DELMAS (E.). **pH et maladies de carence.** [pH and deficiency disorders.]—*Fruits d'outre mer*, 9, 1, pp. 16–21, 3 graphs, 1954.

This review, based entirely on the literature (28 titles), of the connexion between soils pH and mineral deficiencies in crops, includes brief descriptions of the symptoms of the principal deficiencies encountered and the means of correcting them.

CRANDALL (B. S.). **The diseases of the Cinchona tree.**—*F.A.O. Pl. Prot. Bull.*, 3, 3, pp. 33–37, 1954.

Investigations into diseases of *Cinchona* plantations in the western hemisphere established in recent years were conducted mainly by pathologists of the Office of Foreign Agricultural Relations, United States Department of Agriculture. In Bolivia, where the seed-beds were only a patch of cleared jungle, no losses were sustained by damping-off diseases (*Rhizoctonia* [*Corticium*] *solani*), but in other countries, where the beds were carefully prepared, disease, if not checked, produced devastating effects.

In the transplant beds top blight (*Phytophthora parasitica*) [*R.A.M.*, 30, p. 388] caused heavy losses; the disease is present in this phase in Costa Rica, but in Guatemala it causes girdle canker [loc cit.; 30, p. 628]. The prompt eradication of infected plants and regular spraying with Bordeaux mixture have kept the disease under control in the nursery [24, p. 290].

Root rot caused by *P. cinnamomi* [31, p. 634] has occurred in the transplant beds in Peru and Guatemala. Except in poorly drained areas the disease was of small importance at this stage. Strong evidence exists, however, that *P. cinna-*

momi, responsible for plantation root rot in Peru and Costa Rica and for stripe canker in Guatemala, is carried on the trees from the nursery to clean plantation sites. Control has been achieved by the selection of disease-free nurseries. All species and varieties of *Cinchona* used in the plantations are susceptible.

Sclerotium rolfsii [24, p. 472] has caused occasional losses from collar rot in Peruvian nurseries. With advancing age trees become immune; control results from removing infected trees, together with the soil round them.

Thread blight (*Pellicularia* [*Corticium*] *koleroga*) has been found in Central and South American plantations, while horsehair blight (*Marasmius* sp.) was present in Colombia on *Cinchona barbacoensis*.

A leaf spot and premature defoliation of *C. pubescens* is caused by *Prillieuxina cinchonae* in Costa Rica. In Peru the collar rot due to *Phytophthora quininea* [26, p. 467] has not been found in plantations solely of *C. officinalis* of local origin, though such trees were found by experimental inoculation to be susceptible. The production of clean nursery stock and the development of improved planting methods reduced incidence from 75 to under 15 per cent. in other plantations. Locally, *Armillaria mellea* [18, p. 578; 25, p. 45; 30, p. 196] is regularly followed by *P. cinnamomi* and *P. quininea*.

Grey root rot (*Rosellinia* sp.) [24, p. 119; 30, p. 343] has caused losses in Guatemala and Puerto Rico. Physiological root rot due to incorrect planting accounted for the loss of millions of plantation-grown *C. officinalis* trees in Bolivia.

Bourne (B. A.). **Studies on the treatments for improving the germination of Sugar-cane cuttings heat treated for ratoon stunt elimination.**—*Sug. J., N. Orleans*, 17, 10, pp. 31, 33–36, 1955.

In the autumn of 1953 the germination of sugar-cane setts treated for the elimination of ratoon stunt virus by the hot-air method, involving 24 hours' maintenance in a large, closed, electrically heated chamber at 50° C., as practised by the United States Sugar Corporation, Claviston, Florida, was found to be considerably impaired [cf. *R.A.M.*, 33, p. 320]. Experiments were therefore undertaken to find some chemical agent that would interrupt the dormancy of the buds induced by the treatment and permit normal germination. After extensive trials the following procedure was selected. The cane stalks, in 4-ft. lengths, are treated by hot air for 24 hours at 50° or for eight at 54°, allowed to cool to room temperature, and then immersed for a further 24 hours in a 0·2 per cent. solution of sodium peroxide, the cost of which is only $3.62 per acre, reckoning about 16·69 lb. for 1,000 gals. In the case of the eight-hour exposure to a temperature of 54°, a procedure in common use at present, the germination percentage after 13 days was doubled by the chemical bath, and after 25 days the mean height of shoots from cuttings treated in this way exceeded by 169 per cent. that obtained by soaking in tap water.

Diseases.—*Rep. Hawaiian Sug. Exp. Sta., 1953*, pp. 20–25, 5 figs., [? 1953].

It is stated in this report [cf. *R.A.M.*, 33, p. 115] that in preliminary experiments in Fiji, sugar-cane varieties 32–8560, 37–1933, and 37–7202 were resistant to downy mildew [*Sclerospora sacchari*], while 44–3098 was susceptible.

Sugar-cane losses in certain areas were found to be due to chlorotic streak [30, p. 78], leaf scald [*Xanthomonas albilineans*] (observed on 44–3098, a previously resistant variety), and pineapple disease [*Ceratocystis paradoxa*].

Failure of growth, resembling ratoon stunting [33, p. 51] and considered identical with it, was observed in June, 1951, on varieties 47–4991 and 47–112. Since then, internal symptoms of the disease have been observed on several of the imported and standard varieties, which are unaffected by other major diseases. Hot-water treatment (52° C. for 90 minutes or 50° for two hours, or hot air 54° for eight hours)

are recommended for seed pieces to be used for the development of disease-free areas but not for commercial planting material, owing to the injury likely to be caused to the buds of some varieties [see preceding abstract].

Hot-water treatment (52° for 20 minutes) before planting is recommended for the control of chlorotic streak. It increased yields from both diseased and healthy cuttings.

Juice samples [33, p. 115] of plants infected with sugar-cane mosaic were frozen and sent to the University of California, where the size (15×630 mμ) and form (rod-shaped) of the virus particle were determined by A. H. Gold. This appears to be the first demonstration of the size and shape of the sugar-cane virus.

Of ten new fungicides tested against root rot (*Pythium* spp.) only copper-8-quinolinolate warranted further testing.

Hot PMA [phenyl mercury acetate] (1 in 1,600 at 52° C. for 20 minutes or 50° for 30 minutes) gives the greatest protection against *C. paradoxa* and chlorotic streak and stimulates germination at the same time, particularly when used as a dip or a spray on the freshly cut ends of the seed pieces.

Diseases.—*Rep. Hawaiian Sug. Exp. Sta., 1954*. pp. 21–27, 4 figs., [? 1954].

It is stated in this report [cf. preceding abstract] that in further trials in Fiji to determine varietal reaction to ten Hawaiian commercial sugar-cane varieties to downy mildew [*Sclerospora sacchari*] and Fiji disease [*R.A.M.*, 27, p. 97] 37–1933, 32–8560, and 39–7028 were highly resistant, 39–3633 and 38–4443 resistant, and 32–1063 moderately resistant to the former disease, while 39–3633 was resistant and 37–1933 moderately resistant to the latter.

No further spread of the ratoon stunting disease [see preceding abstract] in commercial plantings was observed during the year. Experiments conducted in Hawaii have shown that the disease is controlled by the long hot-water treatment (50° C. for 2 hours) and by the hot-air treatment (54° for eight hours). The disease is readily transmitted by infected cane knives but can be controlled by swabbing with 5 per cent. lysol, 50 per cent. alcohol, 1 in 100 PMA [phenyl mercury acetate] or bionol.

In inoculation trials no evidence was obtained of the occurrence of different strains of the ratoon stunting virus although differences in varietal tolerance were observed. Variety 37–1933 produced more intense internal symptoms than others and may be useful in future transmission studies. Further control measures recommended have already been noticed in this *Review*.

Leaf scald [*Xanthomonas albilineans*: loc. cit.] was moderate to severe on 44–3098 growing on rocky soil under conditions of drought.

Chlorotic streak [loc. cit.], still common in poorly drained areas, was found in tests at Makiki not to be transmitted through the roots.

Leaf freckle, associated with low soil fertility and temperatures, was rare owing to the unusually dry and warm winter of 1953–4.

Similarly, there was little infection of cane seedlings with *Pythium* root rot [*Pythium* spp.: loc. cit.], which was effectively inhibited by pure actidione at 50 p.p.m. Frequent irrigations of the seedlings with a 25 p.p.m. actidione solution are recommended for control.

Red rot [*Glomerella tucumanensis*: C.M.I. map No. 186] was serious on 38–2915 at the Lihue Plantation Company, Ltd. Early harvesting of affected canes is recommended.

The growth failure of 47–4991, planted at Waipio from cuttings which had received the long hot-water treatment, is due to factors other than ratoon stunting.

Very few instances of poor germination due to pineapple disease [*Ceratocystis paradoxa*] are reported following pre-planting treatment with phenyl mercury acetate [see preceding abstract].

Light outbreaks of pokkah-boeng [*Gibberella fujikuroi*: *R.A.M.*, 21, p. 350] were observed on some susceptible varieties.

Seed-treatment with phenyl mercury acetate, cold or hot, immediately following irrigation and two and four weeks after planting resulted in significant germination increases, i.e., 46·7, 51·9, and 51·9 per cent., respectively, for the cold and 76·3, 61·9, and 58 per cent., respectively, for the hot compared with 43, 35, and 17 per cent., respectively, for the untreated.

Abbott (E. V.). **Red rot of Sugar Cane.**—*Aust. Sug. J.*, 46, 10, pp. 669, 671–672, 677, 1955.

In a foreword to this paper describing the incidence of red rot [*Glomerella tucumanensis*: C.M.I. map No. 186] on sugar-cane in the United States and other countries, its symptoms, and measures for its control, the disease is stated to have been very severe in Queensland during the current season. The early harvesting of susceptible varieties was recommended as a means of reducing losses from this source.

Hansford (C. G.). **Tropical fungi. IV. New species and revisions.**—*Proc. Linn. Soc. Lond.*, 165 (*1952–53*), 2, pp. 166–177, 1955.

This continuation of the series [cf. *R.A.M.*, 28, p. 360] includes descriptions of 41 species, ten being new species and five new combinations, all found in the Botanical Department of the State Museum of Natural History, Stockholm. The new species include *Irenopsis berggrenii* on *Acacia* ? *melanoxylon* in Melbourne, *Meliola bixae* on *Bixa orellana* in Para, Brazil, and *M. nashii* on *Magnolia virginiana*.

Subramanian (C. V.) **Studies on south Indian Fusaria. III. Fusaria isolated from some crop plants.**—*J. Madras Univ.*, 24, Sect. B., 1, pp. 21–46, 1954.

A detailed, systematic account is given of the species of *Fusarium* isolated from 13 crop plants in southern India in a further study in this series [cf. *R.A.M.*, 32, p. 624]. The isolates, many of which were mentioned in an earlier paper [31, p. 258], are classified according to Wollenweber and Reinking [14, p. 708].

Ainsworth (G. C.). **The pattern of mycological taxonomy.**—*Taxon*, 3, 3, pp. 77–79, 2 graphs, 1954.

An attempt to determine the general pattern of mycological taxonomy during recent years (from 1920 to 1950) revealed an average number of 50 new genera, 700 new species, and 300 new combinations per annum. One-third of the new taxa are proposed in the journals *Sydowia*, *Mycologia*, *Trans. Brit. mycol. Soc.*, and *Bull. Soc. mycol. Fr.* A random sample of 250 taxa from 1920 and from 1950 showed that these were published in a total of 31 and 53 different publications, respectively, so that the scatter of publication has increased during this period.

The number of new species per new genus has remained fairly constant over the past 20 years at between 10 and 20. In the Plasmodiophorales the average number of species per 'good' genus is 1·5, rising to 36 in the Uredinales, with about 10 for the fungi as a whole. It is probable that half the species proposed recently are destined for synonymy. Since the war the number of new combinations has risen considerably, indicating increasing revision.

Cunningham (G. H.). **Taxonomic problems of some Hymenomycetes.**—*Trans. roy. Soc. N.Z.*, 82, 4, pp. 893–902, 1955.

In this address to the botanical section of the 8th Science Congress of the Royal Society of New Zealand, held in Auckland from 17th to 21st May, 1954, the chairman discusses the methods used by him to solve taxonomic problems in the Polyporaceae and Thelephoraceae [see next abstract]. The splitting of the Friesian

genera of the Polyporaceae on the basis of their hyphal structure, following Corner [*R.A.M.*, 34, p. 487], is outlined and an amended key to the genera of the Thelephoraceae, based on the author's studies, is presented.

CUNNINGHAM (G. H.). **Thelephoraceae of New Zealand. Part IV. The genus Vararia.**—*Trans. roy. Soc. N.Z.*, 82, 5, pp. 973–985, 6 figs., 1955.

In a further contribution to this series [cf. *R.A.M.*, 34, p. 259] the author takes up the genus *Vararia*, segregated from *Corticium* by the presence of dichophyses, which are small, dendriform structures arising from a simple stem and compose the bulk of the context and hymenial tissues. Seven species are described and illustrated, including the type species *V. investiens*, described in 1903, three new species, and three new combinations, all of which are found on dead branches.

BAKER (SHIRLEY D.). **The genus Albugo in New Zealand.**—*Trans. roy. Soc. N.Z.*, 82, 5, pp. 987–993, 1 fig., 1955.

The genus *Albugo* is redefined and upheld, according to the International Rules, against *Cystopus* [cf. *R.A.M.*, 27, p. 542]. Four species occurring in New Zealand are described, *A. tragopogi* [*C. tragopogonis*] on Compositae, *A. cruciferarum* [*C. candidus*] on Cruciferae, *A. quadrata* n.comb. [*C. portulacae*] on *Portulaca oleracea*, and a new species *A. mesembryanthemi* on *Mesembryanthemum* spp.

DE VRIES (G. A.). **Cladosporium avellaneum de Vries, a synonym of 'Hormodendrum' resinae Lindau.**—*Leeuwenhoek ned. Tijdschr.*, 21, 2, pp. 166–168, 1955.

Cladosporium avellaneum f. *viride* de Vries [*R.A.M.*, 33, p. 116] is a synonym of *Hormodendrum resinae* [34, p. 9] and is designated *C. resinae* n.comb. f. *resinae*. The names of the three saltants f. *avellaneum*, f. *albidum*, and f. *sterile* are retained.

KARLING (J. S.). **Galls induced by Synchytrium and their relation to classification.**—*Amer. J. Bot.*, 42, 6, pp. 540–545, 11 figs., 1955.

Galls caused by species of *Synchytrium* [*R.A.M.*, 34, p. 186] may be classified as sporangial or resting spore types and may be either simple (one enlarged infected cell) or composite (infected cell more or less enveloped in a sheath of healthy cells). If the incipient sheath cells become infected, causing secondary galls, the whole is a compound gall, or, if the sheaths become confluent, a confluent gall.

The short-cycled species cause exclusively either sporangial or resting-spore galls, and are either simply or compositely monogallic. Long-cycled species are digallic: if both gall types are alike in structure, they are described as (simply or compositely) dihomeogallic, or, if dissimilar, diheterogallic.

OBERTHÜR (K.). **Über die Anfälligkeit verschiedener Tabak-Arten, -Sorten und Zuchtstämme gegen Thielavia basicola (B. et Br.) Zopf.** [On the susceptibility of various Tobacco species, varieties, and selections to *Thielavia basicola* (B. & Br.) Zopf.]—*Züchter*, 25, 1–2, pp. 17–26, 5 figs., 1955.

In preliminary experiments at the Tobacco Research Institute, Dresden, the 24 varieties of *Nicotiana rustica* grown in soil contaminated by *Thielaviopsis basicola* [*R.A.M.*, 15, p. 61] remained immune, whereas all the 144 of *N. tabacum* were more or less severely attacked. Among the most resistant were Siebenhausener, Krim, Djubek Limonnihi, Badischer Geudertheimer, Tscherwen Zwjat C, Padeschki Wisok, selection of 'Rila 9', Debreciner, and NF Feinschnitt (type II), and the prospects for the breeding of commercially acceptable types capable of withstanding infection under German climatic conditions are regarded as hopeful. It is emphasized that the degree of soil infestation by *T. basicola* is a more important actor than insufficient manuring in the failure of the crop. Pending the develop-

ment of resistant varieties, disinfection of seed-bed soil with steam, formalin, or [unspecified] fungicidal solutions is indispensable.

Schmelzer (K.). **Die Übertragbarkeit des Tabakmauche-Virus durch Cuscuta-Arten.** [The transmissibility of the Tobacco stem-mottle virus by species of *Cuscuta*.]—*Naturwissenschaften*, **42**, 1, p. 19, 1955.

At the Institute for Phytopathology, Aschersleben, Germany, the [potato] stem-mottle virus [*R.A.M.*, 34, p. 53] was readily transmitted from diseased to healthy Samsun tobacco plants [32, p. 145] by the attachment of shoots of *Cuscuta campestris* and *C. subinclusa* to the stems or petioles. The first symptoms, developing within seven days, consisted of grey discolorations which clearly emanated from the haustoria penetrating the host tissues. The mechanical inoculation of tobacco plants with undiluted expressed sap from the two above-mentioned species of dodder also resulted in 100 per cent. infection. Moreover, both dodders showed symptoms of the virosis expressed by shortening of the internodes, slight curvature of the shoots, and occasional tissue necroses. All inoculation experiments with *C. californica* gave negative results.

Vayonis (G. C.). **Phosphorus disturbances in mosaic-virus infected Tobacco plants.** —*Physiol. Plant.*, 7, 4, pp. 687–697, 1 diag., 1954. [Received August, 1955.]

At the Department of Botany and Plant Pathology, Michigan State College, investigation of the phosphorus metabolism of greenhouse-grown tobacco plants inoculated with tobacco mosaic virus [*R.A.M.*, 34, p. 552] showed that six days after inoculation inorganic and total phosphorus had decreased, coinciding with the establishment of secondary symptoms. Phosphate esters increased until the second day in young leaves, then decreased to a minimum below that in the controls on the fourth day, rising well above the control level with the appearance of secondary symptoms.

Uschdraweit (H. A.). **Schutzwirkung eines Virus gegen ein Virusgemisch.** [Protective action of a virus against a virus mixture.]—*Angew. Bot.*, 29, 1, pp. 33–37, 1 fig., 1955.

At the Institute for Horticultural Virus Research, Berlin-Dahlem, Lucullus tomato plants already infected by tobacco mosaic virus were protected against super-inoculation with a combination of the same virus and potato virus X [*R.A.M.*, 32, p. 40], and did not react with the severe necrotic symptoms typically induced by the mixture. No such immunity is conferred by potato virus X.

Wilhelm (S.). **Longevity of the Verticillium wilt fungus in the laboratory and field.** —*Phytopathology*, 45, 3, pp. 180–181, 1955.

At the Department of Plant Pathology, University of California, Berkeley, 17 out of 51 13-year-old cultures of *Verticillium albo-atrum* resumed growth when melted, cooled agar was poured over them, and five were pathogenic to Pearson tomato plants. The microsclerotia of the fungus are exceptionally long-lived and resistant to adverse conditions, including protracted desiccation at high temperatures [*R.A.M.*, 34, p. 308]. Evidence was further secured by the infection index method [31, p. 35] for the persistence of the pathogen for 14 years in field soil with no susceptible hosts present.

Diener (U. L.). **Sporulation in pure culture by Stemphylium solani.**—*Phytopathology*, 45, 3, pp. 141–145, 2 figs., 1 graph, 1955.

Conidial production by *Stemphylium solani*, the agent of grey leaf spot of tomato [*R.A.M.*, 34, p. 189 and next abstract], is somewhat sparse on standard culture media, but at the North Carolina State College profuse development was obtained

on an agar medium containing 12, 16, or 20 per cent 'V-8' juice at a pH of 4·1 to 9·1 and a temperature between 20° and 30° C., combined with five minutes' ultra-violet irradiation from a WL–30 tube [cf. *R.A.M.*, 28, p. 648]. 'V-8' is the trade name of a canned product manufactured by the Campbell Soup Company and consists of extracts of eight vegetables, with tomato predominating. The main stimulus to conidial formation was shown to be exerted by radiant energy of wave-lengths between 312 and 546 mμ.

Paulus (A. O.) & Pound (G. S.). **Effect of air temperature on initiation and development of gray leaf spot and nailhead spot of Tomato.**—*Phytopathology*, 45, 3, pp. 168–174, 7 figs., 1 graph, 1955.

In laboratory studies at the Department of Plant Pathology, University of Wisconsin, both *Stemphylium solani* [see preceding abstract] and *Alternaria tomato* [*R.A.M.*, 18, p. 766], the agents of grey leaf spot and nail-head spot of tomato, respectively, sporulated over a temperature range between 4° and 36° C. The minimum, optimum, and maximum levels for the growth of both pathogens on potato dextrose agar were 8°, 24° to 28°, and 36°, respectively. In the greenhouse the heaviest infection was obtained at 26°, with a significantly lower incidence at 14°. Infection by *S. solani* developed after three hours at 14° or 26°, but at 10° only an occasional lesion was formed even after 24 hours. With dilute inoculum grey leaf spot symptoms varied between very slight at 28° to moderate or severe at 16°. Concentrated inoculum induced very severe effects at 16°, 20°, and 24°, with a marked reduction at 28°. Complete defoliation followed infection by *A. tomato* with either dilute or concentrated inoculum, though the leaves were shed about a week earlier when the latter was used. *S. solani* sporulated on infected plants after 12 hours at 14°, 18°, 22°, and 26°, but not at 10° even after 48 hours. With *A. tomato* sporulation was obtained after nine hours at 14°, 18°, 22°, and 26°, and after 36 to 48 at 10°.

The data secured in a disease survey during 1952 and 1953, when neither fungus was widespread, indicated that the prevailing temperatures in the State largely or entirely suppress the accumulation of grey leaf spot inoculum, while the incidence and distribution of nail-head spot are apparently restricted by the cultivation of resistant varieties.

Annual Report of the Forest, Insect, and Disease Survey, Canada Department of Agriculture, 1954.—135 pp., 22 maps, 1955.

In the section (pp. 23–28) of this report [cf. *R.A.M.*, 32, p. 518] dealing with the forest disease survey of 1954 in the Maritime Provinces, Canada, A. G. Davidson states that an apparently new disease of white pine [*Pinus strobus*] in central New Brunswick is characterized by an excessive flow of resin from cracks in desiccated patches of bark tissue which may be present on all sides of the bole. The crowns of the affected trees sometimes appear thin. Chlorosis and stunting of the foliage may represent a later stage of the disease. A branch canker of balsam fir [*Abies balsamea*] somewhat prevalent in central New Brunswick was probably caused by *Valsa friesii* [25, p. 51]. An undetermined blight of pin cherry (*Prunus pennsylvanica*) with symptoms resembling those caused by bacterial pathogens was widespread throughout New Brunswick, Nova Scotia, and Prince Edward Island. Ash rust (*Puccinia peridermiospora*) [cf. 27, p. 502] was present throughout the western half of Nova Scotia and trees were severely attacked along the southern and western coasts. Collections of willow [*Salix*] blight (*Fusicladium saliciperdum* [*Venturia chlorospora*] and *Physalospora miyabeana*) [32, p. 519] were received from various parts of New Brunswick, Nova Scotia, and Prince Edward Island; infection was most prevalent in the St. John Valley, New Brunswick. *Pollaccia radiosa* was

widespread on trembling aspen [*Populus tremuloides*] throughout New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland. Specimens of the disease were also collected from large-toothed aspen [*P. grandidentata*] and from balsam poplar [*P. balsamifera*]. A rust of white spruce [*Picea glauca*], probably *Chrysomyxa ledicola* [32, p. 520], was common on the Avalon Peninsula, Newfoundland.

R. Pomerleau reports from Quebec (pp. 41–45) that *Cronartium harknessii* [cf. 32, p. 111] had caused galls on the branches of 99 out of 639 Scots pine trees examined in a stand of about 3,500. Many balsam firs, particularly north of the St. Lawrence river, were reported to have died, possibly because of adverse climatic conditions. Affected trees occurred singly or in small groups and were rendered conspicuous by their red foliage [32, p. 520; 34, p. 557], the condition being more prevalent than in previous years.

D. A. Quirke and H. V. Hord, dealing with the survey in Ontario (pp. 70–77), report that 284 collections of poplar canker (*Hypoxylon pruinatum*) [24, p. 255; 32, p. 520] were made throughout the province, over 98 per cent. of which were from *Populus tremuloides* and the remainder from *P. grandidentata*. The host trees ranged from 1 to 10 in. d.b.h., more than half being 3 to 4 in. As in 1953, high concentrations of the disease occurred in the southern parts of the province, but infection had increased in the central and northern areas, 39 collections being made in the Fort Frances district and ten in Kapuskasing. Forty-four collections of red ring rot (*Fomes pini*) [32, pp. 652, 664; 34, p. 419] of conifers were made in widely separated areas, 59 per cent. from white pine, 16 per cent. from jack pine [*P. banksiana*], and the remainder from tamarack [*Larix laricina*], white spruce, black spruce [*Picea mariana*], hemlock [*Tsuga canadensis*], red pine [*Pinus resinosa*], and balsam fir; approximately half the records were from trees 14 to 18 in. d.b.h. *F. pini* probably occurs throughout Ontario. Of the 357 collections of *F. igniarius* made from different areas, 61 per cent. were on trembling aspen; trees 2 to 28 in. d.b.h. were attacked, 50 per cent. of the collections being from 7– to 10-in. trees. Since 1951, Dutch elm disease (*Ceratostomella ulmi*) [30, p. 635; 32, p. 520] has continued to spread eastwards in Essex county and has become more prevalent in Kent county and in the vicinity of Ottawa. New 'spot infections' were found in the counties of Haldimand, Middlesex, and Elgin. Fifty-two further cases of white pine blister rust [*Cronartium ribicola*: cf. 32, p. 519] were recorded, 31 in southern Ontario, nine each in the North Bay area and Sault Ste. Marie, two in Port Arthur district, and one in Sudbury district. Attack was most severe in a plantation near Glenelg Township, Lake Huron district, where approximately 59 per cent. of the trees were infected.

During the year, 2,022 trees, approximately half of them jack pine, were examined for decay in the forest stands of northern Ontario. Tentative identifications include *F. pini* on jack pine and black spruce; *Corticium galactinum* [loc. cit.; 32, pp. 520, 652; 34, p. 414] on black spruce, jack pine, and balsam fir; *Stereum sanguinolentum* [loc. cit.] on balsam fir and black spruce; and *F. igniarius* [see above] and *Radulum casearium* [34, p. 410] on poplar.

Of isolations made at the Provincial Forest Nursery, Orono, from 1,935 red pine seedlings affected by damping-off [32, p. 520] approximately two-thirds were *Rhizoctonia* [*C.*] *solani*; others included *Fusarium roseum*, *F. oxysporum*, *F. tricinctum*, *F. episphaeria*, *Alternaria tenuis*, *Papularia arundinis*, *P. sphaerosperma*, *Epicoccum purpurescens*, *Trichoderma viride*, *Cladosporium herbarum*, and *Penicillium frequentans*.

The study of yellow birch [*Betula lutea*] decay begun in 1953 at Swan Lake in Algonquin Park was completed. The fungi isolated [cf. 34, p. 409] included *Stereum murraii*, *Pholiota adiposa*, *Fomes igniarius* [32, p. 519], *F. fomentarius* [loc. cit.], *Armillaria mellea* [32, p. 518], and *Corticium galactinum*.

Fomes connatus [31, p. 51; 34, p. 3] and canker-forming fungi, mainly species of

Hypoxylon, were frequently associated with scars caused by frost, lightning, and drought on maple [*Acer* sp.].

A canker and die-back of balsam fir was prevalent in central Ontario, especially in the Chalk River and Algonquin Provincial Park areas. The reddish-brown dead needles of affected trees were conspicuous [see above] and fruiting bodies of *Phomopsis* sp. had ruptured the dead bark of many cankered stems. The condition affected mainly regeneration stands and small saplings along roads and at the edges of stands. The damage caused was of economic importance.

Extensive outbreaks of needle rust occurred in the Geraldton and Port Arthur districts; white spruce was attacked by *Pucciniastrum americanum* [30, p. 15] and *Chrysomyxa ledicola* [32, p. 520], black spruce by *C. ledicola*, and balsam fir by *P. pustulatum* [3, p. 114] and *P. goeppertianum* [31, p. 401]. *C. ledi* [cf. 32, p. 279] and *C. cassandrae* [cf. 30, p. 351] also infected black spruce in northern Ontario. *Polyporus obtusus* [27, p. 266] was recovered from white oak [*Quercus alba*] at Baxter Township, Lake Simcoe district.

H. Zalasky reports from Manitoba and Saskatchewan (pp. 97–101). Local epidemics of leaf blight (*Linospora tetraspora*) [18, p. 767] of balsam poplar [*Populus balmsamifera*] occurred in many parts of Saskatchewan, and of aspen leaf spot (*Marssonina castagnei*) in both provinces. A heavy epidemic of needle rust (*C. ledicola*) [see above] of spruce extended throughout the general region of Meadow Lake, Big River, La Ronge, Waskesiu, Candle Lake, and Prince Albert, Saskatchewan.

In the report from Alberta (pp. 108–114) R. J. Bourchier states that during 1954 the known range of poplar canker (*H. pruinatum*) [see above] in Alberta was extended far northward to Mile 250 on the Mackenzie Highway, near Upper Hay River Post. The fungus was also found on trembling aspen in the Cypress Hills, south-eastern Alberta. Needle cast of lodgepole pine [*P. contorta* var. *latifolia*], caused chiefly by *Hypodermella montivaga*, was present in epidemic proportions in parts of the Banff and Jasper National Parks, frequently in areas which had sustained attack by the lodgepole needle miner (*Recurvaria* sp.) for several years. Incidence appeared to have increased considerably since 1953. In two localities lodgepole pine was severely attacked by *Atropellis piniphila* [32, p. 521]. Poplar ink spot (*Ciborinia bifrons*) appeared to have increased considerably. Cone rust, caused chiefly by *Chrysomyxa pyrolae* [30, p. 124], was widespread on white and Engelmann spruce [*Picea engelmanni*].

A. C. Molnar, reporting from British Colombia (pp. 128–135), states that *Fomes igniarius* [see above] was found on hardwoods, on which it causes white trunk rot, in all the areas surveyed. Needle cast of Douglas fir [*Pseudotsuga taxifolia*] caused by *Phaeocryptopus gaeumannii* [C.M.I. map No. 42] was particularly severe on Cortes Island, where 50 to 70 per cent. defoliation of one-year-old needles was not uncommon on smaller trees. *Elytroderma deformans* [cf. *R.A.M.*, 19, p. 248] was prevalent on ponderosa pine [*Pinus ponderosa*]; in several areas it attacked lodgepole pine. Although considerable reduction in the incidence of needle cast (*Hypodermella laricis*) [32, p. 521] had been noted in 1953, severe infection occurred through much of the range of larch in 1954. Numerous reports of cedar leaf blight (*Keithia* [*Didymascella*] *thujina*) were received.

Dying Douglas fir trees were found in the south of Vancouver Island on rocky or well-drained sites and in areas where road-making and similar developments had affected the water table. The trees were heavily infected by weak parasites, mainly *Caliciopsis pseudotsugae* [cf. 22, p. 277] and *Dasyscypha pseudotsugae* [cf. 19, p. 504], and it appeared probable that adverse habitat factors and the delayed effects of the severe drought years 1950 to 1952 were chiefly responsible.

At Kitimat all the major tree species were affected by a disease somewhat resembling brown felt blight (*Herpotrichia nigra*). On amabilis fir [*Abies amabilis*]

35 to 40 per cent. defoliation was not uncommon. All crown classes were affected, and damage was not confined to the lower crown, as is usual with brown felt blight. Straw-coloured to brick-red flags were frequently produced, particularly on *A. amabilis*. A fungus consistently associated with the disease was tentatively identified as a species of *Herpotrichiella*.

Hennig (R.). **Die tierischen und pflanzlichen Schädlinge unserer wichtigsten fremdländischen Holzarten.** [The animal and plant pests of our principal exotic timber species.]—*Z. PflKrankh.*, 61, 5, pp. 255–269, 1954. [English summary.]

This useful survey, collating records of the diseases of exotic (and a few native) trees in Germany, is based on 91 contributions to the literature and some of the author's own observations. Most of the information has been noticed in this *Review*.

Němec (A.). **Krnění a nezdar lesních kultur na hadcových půdách jižních Čech následkem intoxikace niklem, kobaltem a chromem.** [Stunting and failure of forest plantations on serpentine soils in southern Bohemia as a result of nickel, cobalt, and chromium toxicity.]—*Práce výzk. Ust. lesn. ČSR [Stud. For. Res. Inst. C.S.R.], 1954*, 6, pp. 5–54, 3 figs., 27 graphs, 1954. [Russian and German summaries.]

High soil contents of nickel, cobalt, and chromium are reported to be responsible for stunting and failure of pine, birch, willow [*Salix*], and mountain ash [*Sorbus aucuparia*] growing on serpentine soils in southern Bohemia, Czechoslovakia.

Holmes (F. W.). **The Dutch Elm disease as investigated by the use of tissue cultures, antibiotics, and pectic enzymes.**—*Diss. Abstr.*, 15, 1, p. 6, 1955.

At Cornell University [Ithaca, New York], growth of tissue cultures of *Ulmus americana* on Gautheret's agar medium plus coco-nut milk was not affected by the addition of a filtered extract of a *Graphium* [*Ceratostomella*] *ulmi* culture on Zentmyer's medium, though it caused wilt of elm shoots [*R.A.M.*, 29, p. 543]. Coremiospores of *C. ulmi* germinating in elm extract, potato dextrose liquid, or Zentmyer's medium produced a pectic enzyme or enzymes which rotted potato disks and blackened broad bean (*Vicia faba*) leaves.

Of 19 commercial antibiotics, nine inhibited *C. ulmi* at 1,000 p.p.m. in culture [cf. 33, p. 104] but none prevented the subsequent establishment of Dutch elm disease by artificial inoculations when injected into young elms from waxed kraft paper funnels round the trunks. Cultures of 198 named and 176 unidentified fungi, bacteria, and actinomycetes caused various degrees of inhibition when grown adjacent to *C. ulmi* on potato dextrose agar. The most effective was *Bacillus polymyxa* but it did not prevent disease when inoculated into elms six days before they were inoculated with *C. ulmi*.

Toole (E. R.). **Polyporus hispidus on southern bottomland Oaks.**—*Phytopathology*, 45, 3, pp. 177–180, 1 fig., 1 graph, 1955.

From the Delta Experimental Forest, Stoneville, Mississippi, the author reports on the occurrence of trunk cankers and localized decay caused by *Polyporus hispidus* on willow, water, Nuttall, and cherrybark oaks (*Quercus phellos*, *Q. nigra*, *Q. nuttallii*, and *Q. falcata* var. *pagodaefolia*) [*R.A.M.*, 21, p. 396]. In 32 0·1-acre plots laid down at random 13 per cent. of the willow and 3 per cent. of the Nuttall oaks bore one or more cankers on their main stems, mostly within 16 ft. of the ground. In the former species cull resulting from the cankers amounted to 7 per cent. of the cu.-ft. volume of all trees and 18 per cent. of the board-ft. volume of those 16 in. and more in diameter at breast height. An analysis of 55 cankers showed that the heart rot exceeded the length of the cankers by 2·38±1 ft. and that canker length and decay increased by 0·484±0·02 ft. annually.

Stolina (M.). **Čo je pričínou usychania Dubín v L'uboreči?** [What causes the die-back of Oak stands at L'uboreč?]—*Les, Bratislava*, 1 (10), 5, pp. 11–13, 1954. [Received August, 1955.]

At L'uboreč, near Lučenec, Czechoslovakia, dozens of *Quercus sessiliflora* [*Q. petraea*] and *Q. cerris* trees, mostly well-matured and facing south and either with or without shrub undergrowth, suffered top die-back during the growth period, the trunks usually developing epicormic shoots. Some were affected on one side only, a wide strip of cambium extending to the roots being dead. The cause was established to be *Armillaria mellea* which gained a hold following the 1947 drought. *Q. cerris* was less susceptible than *Q. petraea*. Of 100 dead trees (70 of the latter species and 30 of the former) 25 contained fungus strands other than rhizomorphs, 11 had rhizomorphs, 63 both, and one no fungus growth at all. For 100 trees in the same species ratio with partial die-back of the crown the corresponding figures were 56, 6, 1, and 37, respectively.

Magnani (G.). **Alcuni casi di deperimento di Piopelle in vivaio.** [Some cases of die-back of Poplar in the nursery.] —*Cellulosa e Carta* 5, 12, pp. 14–15, 1954. [French and English summaries. Abs. in *For. Abstr.*, 16, 3, p. 386, 1955.]

Year-old seedlings, rooted cuttings, and fresh cuttings of poplar in three nurseries in widely separated parts of Italy exhibited similar symptoms of die-back. Some material yielded two species of *Fusarium* [cf. *R.A.M.*, 31, p. 260] belonging to the *elegans* section of the *bulbigenum* group, but both gave negative results when inoculated into healthy plants. All the stock originated from a nursery near Padua where the moist, sandy soil was optimum for poplar growth but the affected nurseries had compacted soil which was probably the principal cause of the disorder, the *Fusarium* being secondary.

Van Den Ende (G.). **Het parasitaire karakter van Septotinia populiperda Waterman & Cash.** [The parasitic character of *Septotinia populiperda* Waterman & Cash.] —*Tijdschr. PlZiekt.*, 60, 6, pp. 253–255, 2 figs., 1954. [English summary.]

Mature apothecia of *Septotinia populiperda* [see next abstract], the agent of a foliar blotch on several species of poplar in Holland [*R.A.M.*, 31, p. 156], are formed in the spring and early summer on leaves shed the previous autumn.

In inoculation experiments by atomization at the Willie Commelin Scholten Phytopathological Laboratory, Baarn, the ascospores caused infection only on injured leaves, equal numbers of blotches developing on the upper and lower surfaces. *Populus candicans* proved to be more susceptible than *P. marilandica* or *P. brabantica*. In *in vitro* tests ascospore germination was inhibited by contact with copper in the form of Bordeaux mixture or copper sulphate at a strength of 7 to 8 mg. per l.

Schmidle (A.). **Über Infektionsversuche mit Septotis populiperda Waterman et Cash an Populus deltoides.** [On inoculation experiments with *Septotis populiperda* Waterman & Cash on *Populus deltoides*.]—*Angew. Bot.*, 29, 1, pp. 14–25, 5 figs., 4 graphs, 1955.

Inoculation experiments with the conidia and mycelium of *Septotinia populiperda* [see preceding abstract] were performed on the leaves and bark of one- and two-year-old poplar (*Populus deltoides*) shoots during the growing season of 1953 at the Institute for Forest Mycology, Hann.-Münden, Germany [*R.A.M.*, 33, p. 509]. Of 420 injured leaves, 372 (88·6 per cent.) reacted to the operation by more or less severe damage compared with only five (1·8 per cent.) of the 280 unwounded. No infection developed on 70 injured but uninoculated controls. Observations in the nursery in which the tests were carried out showed that the feeding sites of [unspecified] insects provide courts of ingress for the pathogen.

Mycelium was applied through cuts to the cortex of 180 trees and conidia to that of 175. The fungus proved to be capable of spreading through the bark, especially in a longitudinal direction, and destroying it. With both kinds of inoculum the main extension occurred during the first eight days. After 36 days the mycelium attained its maximum extension in the cortex, its advance being subsequently retarded by suberization, though the lesions did not heal completely until the end of the season. Only small injuries were induced by inoculation with conidia and some of them were already closed by the time growth terminated. The application of a moist bandage to the site of inoculation clearly inhibited the growth of the fungus.

GREMMEN (J.). **Op Populus en Salix voorkomende Melampsora-soorten in Nederland.** [Species of *Melampsora* occurring on *Populus* and *Salix* in Holland.]—*Tijdschr. PlZiekt.*, 60, 6, pp. 243–250, 1 fig., 1954. [English summary.]

Of the nine heteroecious species of *Melampsora* encountered in Holland which are described in this paper [cf. *R.A.M.*, 25, p. 145], four are recorded for the first time from the country, viz., *M. allii-populina* with its (*a*) uredo and teleuto states on poplars belonging to the section Aigeiros and (*b*) pycnidia and aecidia on *Allium*(?) *vineale*, *M. larici-tremulae* on (*a*) poplars (Leuce) and (*b*) larch, *M. pinitorqua* on (*a*) poplars (Leuce) and (*b*) pines (principally *Pinus sylvestris*, *P. montana*, and *P. pinaster*), and *M. allii-salicis albae* on (*a*) *Salix alba* and (*b*) *Allium* sp. The others are *M. larici-populina* [loc. cit.] on (*a*) poplars (Aigeiros and Tacamahaca) and (*b*) larch, *M. capraearum* on (*a*) *S. capraea* and other *S.* spp. and (*b*) larch, *M. euonymi-capraearum* [26, p. 267] on (*a*) *S. capraea* and other *S.* spp. and (*b*) *Euonymus europaeus*, *M. repentis* on (*a*) *S. repens* [25, p. 47] and *S. rosmarinifolia* and (*b*) *Orchis* sp., and *M. rostrupii* [25, p. 145] on poplars (Leuce) and *Mercurialis perennis*.

Studies were made on the morphology and pathogenicity of *Melampsora allii-populina*, *M. larici-populina*, *M. larici-tremulae*, *M. pinitorqua*, and *M. capraearum*. The shape of the paraphyses in the uredosori was found to be a reliable criterion for the differentiation of certain species. Thus, in *M. larici-populina* the head is flattened with a greatly thickened top (up to 10 μ), in *M. allii-populina* circular or racquet-shaped and the wall of uniform thickness, and in *M. larici-tremulae* and *M. pinitorqua* oval to elongated. Hosts of *M. arici-populina* included *Populus monilifera* [*P. deltoides*] and *P. balsamifera*; *M. allii-populina* was pathogenic to *P. marilandica* (resistant to *M. larici-populina*); and aecidia of *M. pinitorqua* collected on *Pinus pinaster* produced uredosori on leaf disks of aspen (*Populus tremula*) and *P. canescens*.

BENBEN (K.). **Nowe choroby Topoli.** [New diseases of Poplar.]—*Sylwan*, 98, 2, pp. 91–95, 4 figs., 1954. [Received August, 1955.]

Valsa pustulata caused die-back of *Populus generosa* in a stool-bed in Poland and *Tricholoma populinum* was parasitic on the collar of a three-year-old *P. lloydii* and on the rootlets of several *P.* hybrids.

KRSTIĆ (M.). Три године борбе против ендотиозе у Словеначком приморју. [Three years of Chestnut blight control on the Slovenian coast.]—*Šumarstvo*, 6, 6, pp. 546–554, 3 figs., 1953. [French and German summaries. Received August, 1955.]

From mid-1950 to mid-1953, 42 foci of chestnut blight (*Endothia parasitica*) were found on the coast of Slovenia, Yugoslavia [*R.A.M.*, 31, p. 638], involving 344 ha. out of the total chestnut area of 1,283 ha. The trees were felled, barked, or burnt. The following facts were established: smooth, open wounds seldom present any danger of infection; the mycelium survives for about $1\frac{1}{2}$ years in felled logs; coppicing was reduced by dusting with sodium silicofluoride or killing year-old shoots with the German herbicide Totmon-80; and certain micro-organisms

including *Bacillus subtilis*, an undetermined bacillus, and *Penicillium* spp. inhibited the germination of pycnidiospores and mycelial growth by *E. parasitica* in culture.

ZUCKERMAN (B. M.). **Effects of ionizing radiations, ultrasound, and several chemicals on the Oak wilt fungus.**—*Diss. Abstr.*, 15, 1, p. 21, 1955.

In studies at the University of Illinois X-irradiation at 16,500±2,500 r. permanently inactivated 50 per cent. of the conidia of the oak wilt fungus [*Chalara quercina*: *R.A.M.*, 32, p. 110]. As the dosage was increased the number of germinating conidia decreased and the time lapse prior to maximum germination and secondary spore production increased. At 50,000 to 110,000 r. many conidia formed short, knob-like projections and ceased to develop. Growth in a liquid medium and the ability of the fungus to produce a metabolite [34, p. 411] toxic to oak and tomato cuttings was unaltered by irradiation. Irradiated cultures were pathogenic and produced fertile perithecia. Morphological variations occurred in a ratio of three mutants in irradiated cultures to one in the untreated; all were pathogenic.

Irradiation with a mixed alpha source, uranium 238, resulted in the death of the fungus. Uranium nitrate, injected into wilt-infected seedling oaks, did not arrest the progress of the disease but appeared to retard initial symptom expression. Ultrasound did not affect the vital activities of the fungus. When grown in several concentrations of each of three chemotherapeutants and uranium nitrate the fungus was inhibited by M 4367 at 1 p.p.m. and totally inhibited by 5 p.p.m., but at 0·1 p.p.m. growth was accelerated. The fungus was reisolated from the year-old wood of a tree that had supposedly been successfully treated with M 4367.

BARNETT (H. L.) & TRUE (R. P.). **The Oak wilt fungus, Endoconidiophora fagacearum.**—*Trans. N.Y. Acad. Sci.*, Ser. II, 17, 7, pp. 552–559, 1955.

The authors' survey of the available information on oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*] in the United States [*R.A.M.*, 34, p. 411] is based on 44 contributions to the literature on the subject, nearly all of which have been noticed in this *Review*.

TOOLE (E. R.). **Rot and cankers on Oak and Honeylocust caused by Poria spiculosa.**—*J. For.*, 52, 12, pp. 941–942, 1 fig., 1954.

Poria spiculosa is reported from the Mississippi Delta to be causing cankers associated with extensive heart rot in oaks [*R.A.M.*, 21, p. 270] (*Quercus phellos*, *Q. nigra*, and *Q. nuttallii*) and honeylocust (*Gleditsia triacanthos*). The latter, a new host, was also found infected in Tennessee.

WHITE (N. H.). **The development of the ascocarp of Cyttaria gunnii Berk.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 431–436, 2 pl., 1954.

Cyttaria gunnii [*R.A.M.*, 10, p. 697] is parasitic on *Nothofagus cunninghamii* [cf. 21, p. 507] in Victoria and Tasmania, Australia. The present study was conducted in the Department of Plant Pathology, University of Sydney, on histoid galls carrying all stages of development of the ascocarp, collected from this host in early December, 1945, at Tewkesbury, Northern Tasmania. The ascocarps develop annually from the end of November to February, their number depending on the size of the galls: old galls measure up to 30 cm. or more. At maturity the ascocarps measure about 40 mm. in diameter and are fairly dense. Neither ascogonia nor archicarps were found in the developing ascocarps. The asci were found to be inoperculate. The development of hyphal funiculae connecting the developing apothecia with a central, columella-like structure is unique among the Discomycetes. It is suggested that they may serve as conducting channels for nutrients.

BANERJEE (S.) & SINHA (A. K.). **Sexuality in Polystictus sanguineus (L.) Mey.**—*Sci. & Cult.*, 20, 11, pp. 564–565, 1 fig., 1955.

At the Department of Botany, University College of Science, Calcutta, several

monospore cultures of *Polystictus sanguineus* were started from spores obtained from a single sporophore growing on a log of *Shorea robusta* [*R.A.M.*, 32, pp. 226, 441, and next abstract] in a timber yard in Calcutta. The strain was found to be heterothallic and bipolar [21, p. 273].

Banerjee (S.) & Sinha (A. K.). **A simple method for producing typical sporophores of Polystictus sanguineus (L.) Mey.**—*Sci. & Cult.*, 20, 12, pp. 612–613, 1 fig., 1955.

A new method was developed at the Department of Botany, University College of Science, Calcutta, India, for producing typical sporophores of *Polystictus sanguineus*. Sterile and thoroughly water-soaked sapwood blocks of *Shorea robusta* [see preceding abstract] were kept for two months in Kolle flasks containing a luxuriant growth of *P. sanguineus* isolates at 28° to 30° C., a temperature corresponding to that occurring in nature at the time of the fungus fructification. They were then removed to Petri dishes containing a little water, placed near a window under bell jars which were regularly removed to allow a change of air. Two weeks later several mycelial knots and resupinate fructifications appeared; after 18 days they were supplied continuously with water by means of absorbent cotton pads connecting the fructifications with the water in the dish. The resupinate fructifications soon became effuso-reflexed, but the mycelial knots expanded horizontally into typical pilei only after the 25th day when the blocks were completely exposed to external air.

Srivastava (S. N. S.). **Leucaena spp. hitherto unrecorded hosts of Botryodiplodia theobromae Pat.**—*Sci. & Cult.*, 20, 11, pp. 553–554, 1955.

Botryodiplodia theobromae [cf. *R.A.M.*, 33, p. 254], not previously recorded on *Leucaena pulverulenta*, was found on budwood and rooted cuttings of this species, imported from Indonesia, at the Plant Quarantine and Fumigation Station, Madras. It was brought into culture and its pathogenicity proved in tests on *Hevea* rubber seedlings.

Ferda (J.). **Vliv kouřových plynů na množství a poškození jehlic Smrkových porostů.** [The effect of smoke gases on the number of needles and injury to them in Spruce plantings.]—*Práce výzk. Ust. lesn. CSR* [*Stud. For. Res. Inst. C.S.R.*], *1954*, 5, pp. 283–295, 1 fig., 3 graphs, 1954. [Russian and German summaries.]

Spruce plantings affected by fumes in various parts of Czechoslovakia [*R.A.M.*, 34, p. 7] are characterized by premature fall of the needles. The sulphuric acid content in affected needles is higher than in the healthy ones. Comparative studies have shown that with an increase in sulphuric acid content fewer needles are produced and increasing proportions of them are injured. This injury, characterized by yellow-red spots, occurs at a concentration of 0·4 to 0·5 per cent. sulphuric acid in the dry matter. Needle size in affected plantings is reduced by 8 to 14 mm.

Kangas (E.). **Maannousemasienen (Polyporus annosus Fr.) esiintymisestä, tartunnasta ja tuhoista Suomessa.** [On the incidence, infection, and damage caused by root rot (*Polyporus annosus* Fr.) in Finland.]—*Commun. Inst. For. Fenn.*, 40, 33, 34 pp., 6 figs., 1952. [German summary. Received 1955.]

From 1938 to 1941, at the Finnish Forestry Research Institute, a comprehensive investigation of *Polyporus* [*Fomes*] *annosus* [cf. *R.A.M.*, 31, pp. 92, 640; 34, p.194] was conducted. In this paper are reported some of the new or more important results reflecting specific Finnish conditions.

F. annosus is the most common agent of rot of coniferous wood, particularly spruce. In southern Finland affected conifers average about ten per cent. and

spruce about 12 or in certain areas (such as the Korpikylä-Lintula State forest) up to 15 per cent. All other causes of rotting in spruce together affect only one per cent. of the trees. Spruce is most severely affected on dry heath soils. Less than one in 60 pine trees are attacked.

Dense stands favour infection. In mixed woods dominated by spruce its relative proportion among the trees and the age of the stand seem to make no difference to incidence, but when not a dominant spruce seems to be protected by other trees.

Spruces affected by *F. annosus* are characteristically closely grouped, and on such areas even small regenerative trees are seriously threatened and natural recolonization is prevented.

Infection by means of hyphae is more frequent than by spores, and takes place in the root system, usually by contact, especially where the root is injured, but occasionally also through a healthy root. The way is often prepared by *Armillaria mellea* [34, pp. 116, 332]. *F. annosus* is often associated with other pests, like the giant bark beetle (*Dendroctonus micans*) [34, p. 6] and the ant, *Camponotus herculeanus* [30, p. 38]. Moreover, even where a tree has suffered no other damage, the fungus can become a cause of its drying out.

Itô (K.), Kontani (S.), & Kondô (H.). **Web-blight fungus of Japanese Larch seedlings.**—*Bull. For. Exp. Sta. Meguro* 79, pp. 43–70, 6 pl., 1955. [Japanese, with English summary.]

In further studies at the Government Forest Experiment Station, Meguro, Tokyo, physiological and pathological comparisons were made between *Rhizoctonia* [*Corticium*] *solani* isolated from a web blight on Japanese larch (*Larix kaempferi*) [*L. leptolepis*: *R.A.M.*, 31, p. 153; cf. 34, p. 412], *Rhizoctonia* from typically damped-off larch, *C. solani* from a web blight of leguminous woody plants [32, p. 223], and *C. sasakii* [loc. cit.] from sheath spots of rice plants. Hyphal fusion occurred between the web blight and sheath spot isolates but not between each of these and the *Rhizoctonia*. The *C. solani* isolates from *Robinia pseudoacacia* var. *umbraculifera* [loc. cit.] and larch were pathogenic to rice seedlings, causing web blight symptoms, whereas the *Rhizoctonia* and *C. sasakii* induced quite different symptoms.

It is concluded that the four isolates may be considered as a single species, *C. vagum* [*C. solani*], divided into groups according to the symptom expression, viz., web blight type, damping-off type, and sheath spot type.

Ziller (W. G.). **Studies of forest tree rusts.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 5, p. 4, 1953.

An extensive survey carried out in British Columbia showed the presence of 59 species of forest tree rusts, 14 reported from the Province for the first time. New alternate host records for the region numbered 78, 23 apparently being new to science. The survey led to the discovery of important rusts hitherto unknown locally, such as *Chrysomyxa woronini* on spruce [*R.A.M.*, 30, p. 124]. Further studies are in progress.

Vaartaja (O.). **Seedling diseases of conifers in Saskatchewan.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 9, 5, p. 2, 1953.

During the summer of 1953, serious losses were caused in Saskatchewan nurseries by damping-off of pines (*Pinus resinosa* and *P. sylvestris*) and larch (*Larix sibirica*). Preliminary inoculations suggested that *Pythium* isolates were very virulent, and probably the chief cause of the disease. *Rhizoctonia* [*Corticium*] *solani* was also more virulent than other isolates, but was not commonly associated with conifer damping-off [see above, p. 681]. Species of *Fusarium* isolated comprised *F. oxysporum* and its var. *redolens*, *F. acuminatum*, *F. equiseti*, and *F. sambucinum*.

Top-drying of slow-growing, two-year-old *P. sylvestris* occurred in the over-dense seed-beds and was associated with *C. solani*. Damage in spruce transplants due to frost and drought was constantly associated with *Phoma glomerata*. Experiments on the control of these diseases are in progress.

Birkinshaw (J. H.) & Chaplen (P.). **Biochemistry of the wood-rotting fungi. 8. Volatile metabolic products of Daedalea juniperina Murr.**—*Biochem. J.*, 60, 1, pp. 255–261, 2 graphs, 1955.

A sample of East African pencil cedar (*Juniperus procera*) from Kenya, showing a crumbling brown rot of the heartwood, yielded a fungus which was identified as *Daedalea juniperina*. It is stated to be widely distributed in the east and south of the United States on *Juniperus virginiana* and has been reported on *J. excelsa* from the U.S.S.R. The sporophore, a thick, greyish, corky bracket with a daedaloid pore surface, bears a general resemblance to *D. quercina*, a common pathogen of oak.

From cultures of the fungus, which was grown mainly on a synthetic medium containing glucose, inorganic salts, and a little marmite to supply vitamin B, a new metabolic product, 5-(α-propynyl)-2-formylthiophen, with a melting point of 80° C., was isolated and designated junipal. Indications of a second metabolic product closely related to junipal were obtained, while a third was identified as anisaldehyde.

Van Ree (W.). **Laboratory tests on durability with wood-rotting fungi.**—*Tectona*, 43, 1–2, pp. 37–58, 1954.

Using the Leutritz wood-soil contact culture technique [*R.A.M.*, 33, p. 392], supplemented in some cases by the less satisfactory wood-water technique of Waterman *et al.* [17, p. 785], the author carried out durability tests on a number of Indonesian species of wood inoculated with various tropical fungi [cf. 29, p. 188]. One of the most resistant was teak, with an average weight loss of 6, 4·1, and 1 per cent. after five months (Leutritz) through infection by *Schizophyllum commune*, *Polystictus sanguineus*, and *Polyporus occidentalis*, respectively, as compared with 61·9, 19·5, and 18·6 per cent., respectively, for *Aleurites* sp. Only slight losses were caused in *Intsia bijuga* by *S. commune* (1·7 per cent.) and *Polystictus sanguineus* (6·2 per cent.) as against 66·3 and 38·1, respectively, for *Albizzia falcata*. Other species sustaining heavy reductions in weight from the attacks of *S. commune* (the most virulent of the fungi tested) included oak (*Quercus induta*), *Agathis loranthifolia*, and pine (*Pinus merkusii*), with losses of 55·3, 61·1, and 57·9 per cent., respectively.

Rennerfelt (E.). **Fäulnisversuche mit nach der Wechseldruckmethode getränktem Holz.** [Rotting experiments with wood impregnated by the alternating pressure method.]—*Holz a. Roh-u. Werkst.*, 12, 7, pp. 267–270, 1 fig., 1954.

At the Swedish Forestry Research Institute, Stockholm, samples of pine sapwood were inoculated with *Coniophora puteana*, *Lentinus lepideus*, and *Poria vaporaria* and those of spruce sap- and heartwood with the last-named only before impregnation by the alternating pressure method (*Holz a. Roh-u. Werkst.*, 12, p. 233, 1954). The various salts (including arsenic pentoxide) constituting the preservatives known as T.V. and T.V. 50 were generally well taken up and uniformly distributed, though the impregnation of spruce heartwood presents great difficulties.

Using Leutritz's wood-soil contact method [see preceding abstract], the threshold values for unleached wood ranged from 0·5 to 1·5 kg. salt per cu.m.; after leaching they were two to three times higher.

Rennerfelt (E.). **Forsök med träimpregneringsmedel.** [Experiments with timber preservatives.]—*Försök o. Forskn.*, 11, 12, pp. 97–98, 1 graph, 1954.

In further investigations by the Wood Preservation Committee under the

auspices of the Swedish State Communications Department and other interested parties [*R.A.M.*, 29, p. 546], creosote oil was adjudged to have conferred the most effective protection against rotting [of unspecified origin] in stakes left half-buried in soil for ten years. Used at a strength of 228 kg. per cu. m. it reduced the incidence of decay to 13 per cent. of that in the untreated stakes. Boliden salt [34, p. 418] was moderately effective, Boliden fluoride somewhat less so, and basilite UA useless for the object in view.

Dölger (F. W.). **Neue Erkenntnisse und Möglichkeiten für das Impfverfahren.** [New knowledge of and possibilities for the injection procedure.]—*Holz a. Roh-u. Werkst.*, 12, 7, pp. 382–385, 6 figs., 1954.

Information is presented on the application and performance in Germany of an improved Cobra injection method of telegraph pole preservation [*R.A.M.*, 34, p. 558]. Used in conjunction with the diffusion impregnation or other equally effective procedures, e.g., coal tar oil-Rüping, it raises the cost by DM. 7 to 15 per pole. The additional expense is outweighed, however, by the fact that poles treated in this way can be left in position for 10 to 12 years without inspection, which is nearly as costly. The estimated duration of service life is 40 years. The treatment was shown, moreover, to confer reliable protection on spruce poles against [unspecified] heart and sapwood rots, besides the pine and fir [*Abies*] used in these tests.

Holmgren (H.). **Metoder för impregnering av virke.** [Methods of timber impregnation.]—*Norsk Skogind.*, 8, 11, pp. 425–428, 1954. [English summary.]

This is an up-to-date survey of various standard methods of timber preservation against [unspecified] fungal rots, sap stain, moulds, and insect pests, with observations on the economics of their application in Sweden. The following rough estimates of duration of the service life of treated timber are submitted with the utmost reserve: vacuum pressure and Rüping's economical method [*R.A.M.*, 34, p. 198], over 30 years, Boucherie procedures [34, p. 558] over 25, open tank and osmosis 15 to 25, and immersion, etc., 8 to 20, as compared with seven for untreated material. Mention is also made of santobrite and dowicide as protectants against blueing.

Thomas (A. V.) & Jackson (W. F.). **Durability of treated wooden power-line poles.** —*Malay Forester*, 17, 4, p. 210, 1954. [Received August, 1955.]

In 1933 a number of power line poles were erected in West Country Estate, Kajang, Malaya, after being butt-treated by the open tank process with a mixture of 50 per cent. creosote and 50 per cent. Diesel oil [cf. *R.A.M.*, 33, p. 649]. Before the war a small amount of creosote was poured round the base of each pole and since the war an occasional brush treatment of creosote and Diesel oil has been applied. The average service life for chegnal [*Balanocarpus heimii*] was 16½ years, for merban [*Intsia bakeri*] 16, for kerning [*Dipterocarpus* sp.] 14, for kempas [*Koompassia malaccensis*] 16½, and for light red meranti [*Shorea* sp.] 12. Incised poles did not last any longer than unincised. The short service life of these poles is attributed to initial poor preservative penetration.

Carr (D. R.). **Comparative tests with wood preservatives.**—*Tech. Pap. For. Res. Inst. N.Z. For. Serv.* 4, 48 pp., 8 pl., 1955.

Comparative tests were started in New Zealand in 1952 to determine the effectiveness and permanence under local conditions of a number of wood preservatives in preventing deterioration of timber used in contact with the ground or exposed to the elements without protective paint films. The tests, made with sapwood of New Zealand grown *Pinus radiata* [*R.A.M.*, 32, p. 52], included accelerated graveyard tests, artificial weathering or leaching combined with wood-block soil decay tests,

and natural weathering and corrosion tests. The results so far obtained indicate that of the coal tar preservatives tested creosote (5 lb. per cu. ft. or more) [cf. 34, p. 501] is essential for the preservation of timber used in contact with the ground. Of the water soluble preservatives borax [34, p. 213], when no leaching occurred, was highly fungicidal. Most of the multi-salt preservatives were resistant to leaching, copper zinc chrome arsenate being also effective against all the test fungi (*Lentinus lepideus*, *Poria vaporaria*, and *Lenzites trabea*). Timber treated with acid copper chromate was, however, susceptible to *P. vaporaria* [cf. 32, p. 655] and that treated with fluor chrome arsenate phenol and zinc chrome arsenate to *L. trabea* [cf. 34, pp. 8, 334]. Their resistance to leaching and attacks by fungi which may be tolerant of certain metals, such as copper and arsenic, render multi-salt wood preservatives very valuable.

Tolba (M. K.) & Moubasher (A. H.). **Influence of the origin of the isolate of Rhizoctonia solani on its pathogenicity.**—*Nature, Lond.*, 176, 4474, p. 211, 1955.

In the Department of Botany, Cairo University, seeds of various hosts attacked by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, 33, p. 109] were sown in soils inoculated with the fungus strains isolated from the hosts, the soils being adjusted to 60 per cent. water-holding capacity and incubated at 9° to 15° C. or 21° to 37° for four weeks. In both series two isolates from Giza '30' cotton were almost non-pathogenic (as determined by emergence and damping-off) to tomato and only slightly so to the other hosts while the isolate from Ashmouni cotton was highly pathogenic to the two cotton varieties and pea and appreciably so to tomato, bean (*Phaseolus*), and watermelon. The watermelon isolate was practically non-pathogenic to all hosts. In the high-temperature series the bean isolate was very active against watermelon and pea and moderately so against the other hosts, while the tomato isolate attacked all seedlings of the two cotton varieties and about 60 per cent. of the bean seedlings. It was weakly active as an agent of pre-emergence damping-off of tomato but quite active in causing post-emergence damping-off. The pea isolate was the most active: it destroyed the seedling stands of five host plants completely while the sixth (tomato) was badly damaged. In the low temperature series the tomato, bean, and pea isolates were destructive to all hosts.

These results confirm that there is no specificity in the attack of *C. solani* isolates on the hosts and disprove the view that a strain is usually most active on the species from which it was isolated.

Van Hoof (H. A.). **Verschillen in de overdracht van het Bloemkoolmozaiek virus bij Myzus persicae Sulzer en Brevicoryne brassicae L.** [Differences in the transmission of the Cauliflower mosaic virus by *Myzus persicae* Sulzer and *Brevicoryne brassicae* L.]—*Tijdschr. PlZiekt.*, 60, 6, pp. 267–272, 1954. [English summary.]

The principal vectors of cauliflower mosaic virus in Holland are *Myzus persicae* and *Brevicoryne brassicae* [*R.A.M.*, 32, p. 528], of which the latter was found by Severin and Tompkins in California to be the more efficient [28, p. 262]. In an experiment at the Phytopathological Research Institute, Wageningen, 17 out of 50 individuals of *M. persicae* and 15 out of 33 of *B. brassicae* (the eggs of which overwinter on seed cabbage) transmitted the virus from diseased to healthy cauliflower plants, most of the infections occurring on the first of five to be fed upon for five minutes after three hours' fasting. From these results the virus would appear to belong to the non-persistent group, as defined by Watson and Roberts [19, p. 230]. However, in a second trial, in which the fasting periods ranged from 0 to 20 hours and the feeding times from two minutes to 24 hours, contradictory data were obtained which are interpreted as placing the virus in Watson's persistent group [25, p. 245]. The duration of the fasting periods did not affect the

performance of *M. persicae*, which was, however, much more active as a carrier in short feeding times (two and 15 minutes) than in longer ones. On the other hand, *B. brassicae* was influenced by the duration of both fasting and feeding periods, non-starved individuals, for instance, being much more effective vectors than those previously fasting for 20 hours, while lengthy feeding periods gave better results than short ones.

The outcome of a third test demonstrated the rapid inactivation of virus protein by *M. persicae* during a post-infection fasting period and the contrasting slowness of the same process in *B. brassicae*.

GRAINGER (J.). **Climate, host, and parasite in crop disease.**—*Quart. J. R. met. Soc.*, 81, 347, pp. 80–88, 3 graphs, 1955.

The effects of climate on host and parasite were investigated in relation to two serious crop diseases, potato root eelworm (*Heterodera rostochiensis*) and club root of swedes (*Plasmodiophora brassicae*) in the west of Scotland. For the latter, correlation coefficients were calculated for comparisons over the eight-year period from 1946 to 1953 and means of air and soil temperatures, bright sunshine, and rainfall for the separate months from May to October. Significant and quasi-significant correlations demonstrated the association of a low incidence of infection with a relatively high soil temperature in July, relatively large amounts of bright sunshine in June, July, and September, a relatively low rainfall in September, and a relatively high one in October.

GATES (L. F.) & HULL (R.). **Experiments on black leg disease of Sugar-Beet seedlings.**—*Ann. appl. Biol.*, 41, 4, pp. 541–561, 21 graphs, 1954.

In isolations made in Lincolnshire in 1937 and 1938 from sugar beet seedlings affected by black leg, *Phoma betae* [*R.A.M.*, 29, p. 240] was the most prevalent fungus, though *Pythium* spp. (usually *P. intermedium* or *P. ultimum*) [loc. cit.] sometimes predominated when the plants were very young. *Fusarium* spp., mainly *F. angustum* and *F. culmorum* [loc. cit.], were predominant in acid soils. *Rhizoctonia* [*Corticium*] *solani* [loc. cit.] was found in seven of 29 samples, but predominated in only one. *C. solani* seldom causes heavy losses. It occurs on light and heavy soils at pH 5 to 9. Successive field sowings in April and May, 1939, 1949, and 1950, showed that as the soil temperature increased the proportion of seedlings affected by black leg (chiefly *Phoma betae*) consistently declined by 0·8 to 2·4 diseased seedlings per 100 per 1° F. rise in temperature, stands from untreated seed in cold soil containing up to 45 per cent. affected seedlings. When the seed was treated with panogen or ceresan, black leg ranged from 5 to 23 per cent., decreasing (except in the 1939 experiments with ceresan) by 0·3 to 1·5 per cent. per 1° rise in temperature. In small-scale trials seed treated with panogen, thiram, or ethyl mercury phosphate regularly produced better stands than seed treated with ceresan or agrosan. Seed dressing appeared to decrease disease incidence by a similar factor in all sowings of any one experiment. Thus, in 1939 untreated sowings had three to five times as many diseased seedlings as the treated, in 1949 twice as many, and in 1950 six times as many.

In large-scale experiments the average increase in seedling emergence after treatment with panogen, thiram, and agrosan varied in different years from +6·4 to −19·2 per cent. Response to seed dressings increased as the time required for emergence increased and as percentage emergence decreased; when emergence was 50 per cent. of the possible (a common figure), dressing gave an average of 20 per cent. more seedlings. The response increased on soils with a pH somewhat unfavourable to beet-growing, particularly on acid soils. Of these, light sands or peats gave responses above, and heavier soils responses below the average. Response to dressing also increased on soils to which farmyard manure had been applied.

Maximum emergence varied from year to year between 2,100 and 2,700 seedlings per oz. seed, and the minimum between 690 and 1,050, the figure for light soils being 1,400 and for heavy 1,550. The best stands were obtained at pH 7 to 7·4; at values below 6·5 and above 8·7 the stands did not exceed 75 per cent. of these.

In these experiments, for each 1 per cent. increase in seedling stand the final stand of plants was increased on an average by 0·2 per cent.

HULL (R.). **Sugar Beet yellows in Great Britain, 1953.**—*Plant Path.*, 3, 4, p. 130, 1954.

In 1953 counts of sugar beets affected by yellows virus [*R.A.M.*, 33, p. 272; 34, p. 13] made by the agricultural staff of the British Sugar Corporation in sample fields in Great Britain gave 0·05 per cent. infected at the end of June, and 2, 6·1, and 12·7 per cent. at the end of July, August, and September, respectively. An independent estimate, based on the acreage carrying varying proportions of infected plants, gave an average of 8·1 per cent. infected plants at the end of August. In a year of record yield the calculated loss was 0·39 tons of roots per acre.

The disease was more uniformly distributed than usual. Only small areas in the east and west Midlands and the south had crops with more than 20 per cent. infection. Incidence was lowest throughout the Midlands, in parts of the south and Yorkshire, and in Scotland, where the average percentage infection was under 1, except in small areas along the Firth of Forth, where it was up to 20 per cent.

Unfavourable weather for aphid flights in May and June probably accounted for the slow increase in infection. By the end of July, however, infestation of *Myzus persicae* was the highest recorded since the surveys began in 1946, but was too late to cause spread in the root crop, though steckling beds sown in July in eastern England, except round Bedford, became heavily infested, and later many of the plants developed yellows.

COSTA (A. S.) & BENNETT (C. W.). **Studies on mechanical transmission of the yellows virus of Sugar Beet.**—*Phytopathology*, 45, 4, pp. 233–238, 1 fig., 1955.

In experiments at Riverside, California, during 1952 and 1953, beet yellows virus [*R.A.M.*, 34, p. 567] was transmitted by mechanical sap inoculation [cf. 29, p. 71; 32, p. 228], but usually to only a small percentage of the plants tested (numbering over 50 species). Sugar beet and *Chenopodium murale* were the only species to develop both local chlorotic or necrotic lesions and systemic infection, the former appearing 10 to 20 days after inoculation. *Beta macrocarpa*, *B. maritima*, and *B. procumbens* also occasionally contracted infection in some of the tests.

Besides the species or variety of test plant, other factors influencing the success of transmission were the period of preconditioning in the dark and the source and strain of the virus. Thus, maintenance in the dark or under subdued light for a maximum period of four or five days before inoculation increased the incidence of infection. The best sources of inoculum were *C. murale*, *Tetragonia expansa*, and sugar beet plants showing marked symptoms of infection, while sap from *C. amaranticolor* gave consistently poor results. Of 105 sugar beet varieties and inbred lines tested, U.S. 75 was the most susceptible. Some virus strains were more readily transmitted than others.

ERNOULD (L.). **La végétation, les ennemis et les maladies de la Betterave, en Belgique, en 1953. La végétation, les ennemis et les maladies de la Betterave, en Belgique, en 1954.** [The growth, pests, and diseases of the Beetroot in Belgium in 1953, The growth, pests, and diseases of the Beetroot in Belgium in 1954.]—*Publ. Inst. belge Amélior. Better.*, 21, 3, pp. 123–159, 1953; 22, 4, pp. 171–214, 1954. [Flemish and English summaries.]

During 1953 [cf. *R.A.M.*, 32, p. 530] manganese deficiency was prevalent in Belgian sugar beet crops, and several cases of severe magnesium deficiency [34,

p. 566] were also observed. Beet yellows virus [33, p. 516] appeared later than in the preceding year, the average percentage of infected plants on 14th July being 14 as compared with 26 at the same time in 1952, while the corresponding figures for 15th August were 49 and 73, respectively. During September the disease became practically ubiquitous, but the damage sustained was considerably less than in 1952. The virus also caused a relatively slight loss in 1954, the average percentage of infection at the beginning of September being 34 and the maximum reduction in sugar yield 12 per cent. (in the Hainault). Fungus diseases were unimportant in both seasons.

DARPOUX (H.), LEBRUN (A.), & ARNOUX (M.). **Sur le phénomène de la contamination par le Cercospora beticola.** [On the phenomenon of infection by *Cercospora beticola*.]—*Phytiatrie-Phytopharm.*, 2, 4, pp. 125-131, 2 graphs, 1953.

In vitro studies in France demonstrated that the optimum temperature for spore germination of *Cercospora beticola* lay between 24° and 26° C., very little occurring below 14° or above 35° to 36°. Beet plants were not infected below 15° or above 34° or when the relative humidity was below 80 per cent. [*R.A.M.*, 31, p. 364]. In a greenhouse temperature of 18° to 20° no marked infection occurred until the plants had been in a saturated atmosphere for at least three days. Further studies demonstrated that it was only by chance that a germ-tube penetrated a stoma [5, p. 669] and that the susceptibility of the plant was related to the number of stomata. Up to five days may elapse between spore germination and plant infection in a susceptible variety and up to eight in one relatively resistant.

In both field and greenhouse studies 2 per cent. Bordeaux mixture prevented infection under optimum conditions when applied within three days of leaf inoculation with spores or within four days of inoculation with ground mycelium. It would appear, therefore, that in practice a treatment would be effective when applied within three days of spore dissemination and germination following rain. Allowing two to five days for spore dispersal to take place and three more for infection there would be five to eight days, even under the most favourable conditions for the disease, in which to treat the plants before severe infection could be established [see next abstract].

This provides a basis for a spray warning service which, however, would require the setting-up of an observation plot in each beet-growing region in an area favourable to the disease.

DARPOUX (H.), ARNOUX (M.), & LEBRUN (A.). **Étude de l'influence des attaques du Cercospora beticola sur la Betterave sucrière.** [Study on the effect of attacks by *Cercospora beticola* on Sugar Beet.]—*Phytiatrie-Phytopharm.*, 2, 4, pp. 133–137, 3 graphs, 1953.

Experiments were conducted in France during 1952 and 1953 to determine the effect of *Cercospora beticola* [see preceding and next abstracts] on the leaves and roots of sugar beet plants. The average number of lesions per leaf in plantings treated with Bordeaux mixture was 18 at Versailles and 57 at Laon in 1952 and 30 and 73 respectively, in 1953; 159 and 238 and 426 and 269, respectively, being the corresponding figures in untreated plantings. In seasons of severe attack the differences are even greater. In another experiment the plants were inoculated on 12th June, 1953, lesions appeared on 30th June, and by 10th October the difference in weight between treated and untreated plants had reached 44 per cent. There was no marked difference in the sugar content of the roots, expressed as soluble dry matter, up to 20th August, but from the beginning of September there was a difference of about 10 per cent., whilst by the 10th October the loss per ha. due to the disease was about 45 per cent.

In an experiment to determine yield losses as a function of the time of

primary infection, plantings inoculated on 12th June and 3rd July sustained less than 30 to 35 per cent. loss in root weight and less than 2 per cent. sugar content compared with treated plants. On the other hand losses in lots inoculated after 16th July were below 10 per cent. in weight and 0·5 per cent. in saccharose content. Yields were comparable with those from lots infected naturally and left untreated.

It appears, therefore, that in a year of average attack by *Cercospora* only early infection causes any important yield reduction so that an early spray is necessary to destroy the primary infection foci, a second should be applied a little later if temperature and humidity favour further spore invasions, and a third may be given to protect the foliage up to harvest time.

Darpoux (H.), Arnoux (M.), & Lebrun (A.). **Essais de traitements contre le Cercospora beticola.** [Experiments on the control of *Cercospora beticola*.]—*Phytiatrie-Phytopharm.*, **2**, 4, pp. 139–144, 1953.

Experiments were conducted at Chateau-Thierry in 1952 and Laon in 1953 on the control of beet leaf spot (*Cercospora beticola*) [see preceding abstracts] with a view to devising a spray calendar. The disease was moderately severe in both years. The results demonstrated that in a normal year it may be controlled satisfactorily in both places by two treatments with 1 per cent. Bordeaux, one early in July and the other at the beginning of August. The efficacy of new materials was tested in the greenhouse and that of commercial products in the field, the results of the former being expressed as the average number of lesions per leaf 20 and 33 days after inoculation. Field results were assessed by leaf condition and the weight and dry matter content of the roots.

The primary foci appeared at the end of June and secondary foci in July. Treatments were applied on 6th July and 4th and 27th August. On 15th September the average numbers of lesions per leaf were: 1 per cent. Bordeaux 73; 0·5 per cent. copper oxychloride plus zineb 115; and the untreated controls 269. Other products used were ineffective at the rates employed. At harvest on 30th September the root yields, expressed as a percentage of the control, in these two treatments were 128·5 and 132·8, and the percentage soluble dry matter content 20·9 per cent. in both and 19·2 in the control. In seasons of severe attack the spray dosage would probably need to be increased.

Hubbeling (N.). **Een virus als oorzaak van de zogenaamde 'voetziekte' bij Erwten.** [A virus as cause of the so-called 'foot rot' of Peas.]—*Zaadbelangen, 1954*, 14, 1954. [Abs. in *Zbl. Bakt.*, Abt. 2, 108, 21–22, pp. 636–637, 1955.]

Mention has already been made from another source of the author's opinion that the foot rot of peas attributed to *Fusarium solani* in Holland is actually caused by the pea leaf roll virus [*R.A.M.*, 34, p. 505]. Suspected winter hosts are clover and lucerne. Among the best of the 90 varieties which proved tolerant or resistant in field trials were the German selections Ceres, Delex, Deli, Delisa, Diamant, Duplex, Duplika, Exalda, Foli, Hada, Heralda, Juwel, Salzmünder Edelperle, Salzmünder Frühe, Salzmünder Grüne, Titan, Wunder von Weissenfels, and Zeiners Grüner Bastard.

Wieringa (K. T.). **Rode verkleuringen, waargenomen bij Erwten en Bonen.** [Red discolorations observed on Peas and Beans.]—*Tijdschr. PlZiekt.*, 60, 6, pp. 259–260, 1954. [English summary.]

Bacterium rubefaciens was found to be responsible for a purplish-red discoloration of samples of bean (*Phaseolus*) [*vulgaris*] seed from North Holland and peas from England submitted for examination to the Laboratory for Microbiology of the Agricultural College, Wageningen. The pigment is soluble in water. Infection presumably occurred under adverse weather conditions at harvest time. The organism cannot be regarded as pathogenic.

Mastenbroek (C.). **Over de bestrijding van de vetvlekkenziekte in Stambonen.** [On the control of halo blight in French Beans.]—*Tijdschr. PlZiekt.*, 61, 2, pp. 29–34, 1955. [English summary.]

Bean [*Phaseolus vulgaris*] halo blight (*Pseudomonas medicaginis* [f. sp.] *phaseolicola*), an important disease in the predominantly damp and windy climate of Holland [*R.A.M.*, 34, p. 567], cannot be controlled by roguing infected plants. Better results may be obtained by eradicating not only diseased individuals but all surrounding plants within a radius of 1 to 2 m., but even this practice does not ensure complete elimination. Sound seed procured by hand-picking healthy pods may be propagated in isolated plots, in which spraying should begin as soon as the primary leaves are expanded, at least three applications being made at fortnightly intervals. The outcome of experiments on the Ceka variety with 1 per cent. copper Bayer in 1944 and 1945 demonstrated the practicability of raising a good crop from diseased seed.

Klinkowski (M.), Köhler (H.), & Schrödter (H.). **Möglichkeiten der Desinfektion fettfleckenkranken Bohnensaatgutes durch Antibiotika unter Berücksichtigung des Einflusses meteorologischer Faktoren.** [Possibilities of the disinfection of grease spot-diseased Bean seed by antibiotics, having regard to the influence of meteorological factors.]—*Phytopath. Z.*, 23, 4, pp. 345–380, 7 figs., 1 diag., 9 graphs, 1955.

In greenhouse and field experiments at the Institute for Phytopathology and the Agrarian-Meteorological Research Station, Aschersleben, Germany, natural infection of bean [*Phaseolus vulgaris*] seed with *Pseudomonas* [*medicaginis* f. sp.] *phaseolicola* was substantially reduced by treatment with culture filtrates of *Penicillium chrysogenum* and *Streptomyces griseus*, especially the latter. In the field in 1952 and 1953 the treated seed produced yields up to 2½ times as large as the untreated. The application to the seed of 100 p.p.m. crude streptomycin [*R.A.M.*, 30, p. 597] suffices to prevent an attack without damage to the plants; at a strength of 200 p.p.m. the antibiotic becomes phytotoxic. Up to 300 ml. of culture filtrates can be absorbed by the roots without injury to the plants.

Under field conditions the success of seed treatment was promoted by an increase in soil temperature during the first few days after sowing. At temperatures above or below the optimum for infection (16·4° C.) the effects of the treatment begin to operate immediately after sowing, whereas at and around the optimum they are deferred until emergence, with a consequent loss of efficiency.

Stone (L. E. W.). **Carrot fly and 'canker' of Parsnips in the south-west.**—*Plant Path.*, 3, 4, pp. 118–121, 1954.

Experiments were conducted from 1949 to 1953 near Bristol to determine whether control of carrot fly (*Psila rosae*) on parsnips would reduce canker [*R.A.M.*, 34, p. 506]. At Frenchay in 1949 Lisbonnais parsnips were dusted with 2½ per cent. BHC dust (½ oz. per row) on 12th and 30th May to control the first generation of the fly. In late September 60 per cent. of the treated and only 32 per cent. untreated from an adjacent block were free from canker. In 1951 four applications of 2½ per cent. BHC dust were given in May and June, and three in August and September to four varieties. On 7th September 90 per cent. of the crowns in the dusted plots were free from carrot fly injury and canker. In all the other treatments (various forms of cultivation) 50 per cent. or more of the crowns were injured by the larvae and bore incipient canker. Yates Selected was more susceptible than the other varieties.

In 1952 the treatments were the same as in 1951, except that a 1·6 per cent. *gamma*-BHC dust was used. Four varieties, two the same as the previous year, were grown. Seven applications were given in May and June and three in August.

In October canker ranged from 85 to 95 per cent. on the cultivated plots but was only 36 per cent. on the dusted. In both years canker became severe after heavy rain in August and September. Yates Evesham and Syston's Intermediate were the most susceptible.

In 1953 some plots of three varieties were sprayed once with 0·1 per cent. DDT against first generation fly, or twice, once against each generation, or given seed treatment with a mercury-BHC compound at 1 oz. per lb., or dusted with 1·6 per cent. *gamma*-BHC, 1 oz. per 5-yard row being applied at first fly emergence in mid-May, after thinning in early June, and in late July. Heavy rain fell in July and August, and much canker developed. In October the dusted roots had 63 per cent. canker, as against over 90 per cent. for the other treatments.

Seed treatment of the Lisbonnais variety (4 oz. per lb.) with 40 per cent. aldrin, 50 per cent. *gamma*-BHC, 50 per cent. dieldrin, and untreated, gave, respectively, 38, 37, 33, and 11 per cent. clean crowns in November. In all three years no benefit resulted from late sowing.

In 1953 every individual parsnip in the samples was assessed at Frenchay by eye for carrot fly injury and canker. With fly injury 'absent', all of 15 roots had no canker; with injury 'slight', 14 roots had no canker and 33 slight; the figures for injury 'moderate' were, 22 slight canker and 55 moderate; and for injury 'severe' 1 root had no canker, 3 slight, 51 moderate, and 106 severe. Similar results were obtained at Cheltenham and Mickleton on much heavier soil; in no instance was canker present in the absence of carrot fly mines.

The form of canker found at Frenchay was evidently initiated by carrot fly attack. Its later development was influenced by many factors, the most important being, perhaps, summer rainfall. In the conditions applying in the west of England dusting would have to be both frequent and heavy to give commercial control in wet seasons.

Powlesland (Ruth). **On the biology of Bremia lactucae.**—*Trans. Brit. mycol. Soc.*, 37, 4, pp. 362–371, 3 figs., 1954.

At Imperial College of Science and Technology, London, heavy infection of Trocadero Improved lettuce seedlings by *Bremia lactucae* [*R.A.M.*, 27, p. 108] was induced by spraying with a spore suspension and incubating for 24 hours at 15° to 21° C. in a saturated atmosphere, followed by seven to ten days in uncontrolled conditions, then one to two days of high humidity to induce sporulation on the lesions. Temperatures of from 2° to 20° during the initial period induced equal infection, but none occurred at 25°. Sporulation occurred at 4° to 20° during the second moist period but not at 1° to 2° or at 25°. The relative humidity necessary for sporulation ranged from 100 per cent. to between 80 and 90 per cent.

Good spore germination occurred in tap water: the percentage was not increased by the addition of certain nutrients. The optimum temperature for germination ranged from 10° to 15° and for germ-tube growth in the initial stages it was 15°. The spores are short-lived, their germinative capacity being markedly reduced after two days at relative humidities below 50 per cent. Even above this figure they generally died after eight or nine days. Penetration took place in inoculated leaves at temperatures of 1° to 20° but not at 25° and was confined to the cuticles. Cross-inoculation experiments confirmed that biological races of *B. lactucae* exist [26, p. 3]. The lettuce form infected only *Lactuca* spp. and a form on *Senecio vulgaris* infected only *Senecio* sp.

Mehta (P. R.), Singh (B.), & Mathur (S. C.). **Observations on known and new diseases of field crops in Uttar Pradesh during 1951–52.**—*Plant Prot. Bull., New Delhi*, 5, 2, pp. 52–53, 1953. [Received 1955.]

The incidence of groundnut leaf spot (*Cercospora personata* [*R.A.M.*, 32, p. 176]

and *C. arachidicola* [30, p. 405]) in Uttar Pradesh was greatly reduced by sulphur dusting (16 lb. per acre), resulting in 40 per cent. yield increase with rounds at 10-day intervals and 30 per cent. at 15 days. Similarly, sprays of Bordeaux mixture (2–2–50), perenox (0·15 per cent.), and cupravit (0·15 per cent.) at 15-day intervals gave increases of 15, 20, and 30 per cent., respectively, in late-maturing plants.

Of the twelve groundnut varieties tested for resistance to root rot (*Sclerotium rolfsii*) [loc. cit.], T 1 and T 15 were slightly susceptible (below 2 per cent. infection) and 6–2, 11–11, 14, 16–4, 17, 19, 22, 24, 25, and 4201 [loc. cit.] developed no infection.

Gillier (P.). **Étude des symptômes de carence en éléments majeurs sur Arachide.** [A study of the symptoms of deficiency in major elements on Groundnut.]—*Oléagineux*, 10, 7, pp. 479–480, 1 col. pl., 1955.

Brief descriptions, accompanied by a useful coloured plate, are given of the symptoms of mineral deficiency that appeared on groundnut plants grown in nutrient solutions at the Bambey section of the Institut de Recherches pour les Huiles et Oléagineux, Senegal [cf. *R.A.M.*, 25, p. 252; 26, p. 181].

Delmas (J.). **La culture du Champignon de couche : techniques nouvelles.** [The culture of the edible mushroom: new techniques.]—*C.R. Acad. Agric. Fr.*, 40, 10, pp. 409–410, 1954.

The author briefly summarizes the results of experiments made or supervised during the last three years by the Research Station of the Mushroom Growers' Federation [*R.A.M.*, 34, p. 75] at Saint-Cyr-l'École. Preliminary thorough breaking up and mixing of the manure [see next abstract] has in most cases lead to a crop increase ranging from 30 to 50 per cent. Speedier working of the manure on the lines of 'flooring', an English technique, ensures maximal reduction of the anaerobic parts of the fermenting pile and prevents important loss of carbonic matter.

Boxes ensure best conditions for the development of spawn, better aeration of the medium, and substantial economies of raw material. The boxes used hold 18 to 20 kg. compost and produce 2·5 to 4 kg. mushrooms. Further heating should be done in an insulated room at 55° to 56° C. for 12 to 24 hours in an atmosphere saturated with moisture by the injection of water vapour. This ensures the destruction of parasites. It is followed by incubation at 18° to 22° by external heating in a saturated atmosphere until the mycelium has thoroughly penetrated the compost. These new techniques, to which one must add the use of artificial manure, have increased crops by 25 to 50 per cent.

Trocmé (S.) & Sarazin (A.). **Possibilités d'emploi d'un appareil mécanique dans la préparation de fumiers pour Champignon.** [On the possibility of using a machine for the preparation of manure for Mushrooms.]—*C.R. Acad. Agric. Fr.*, 40, 18, pp. 702–704.

The Research Station of the Mushroom Growers' Federation at Saint-Cyr-l'École [see preceding abstract] has built an apparatus designed by A. Sarazin, for the preparation of fermented compost. It consists of a wooden cylinder on a horizontal axle; the inner diameter is 1·9 m. and the length 2·4 m. with a total volume of 6·8 cu. m., and a capacity of 600 to 800 kg. dry straw or manure. The temperature can be regulated by steam entering through the axle. The cylinder is ventilated in the same way and through holes in the sides. It is revolved by a motor, a speed of $\frac{2}{3}$ revolution per minute intermittently being suitable. About 60 kg. dry horse manure was placed in the cylinder and wetted with 150 l. of water. The temperature was raised to 65° C. when ventilation was started. The mixture was moistened every day. In seven days the temperature fell to 45°, while the carbon dioxide percentage in the escaping gases decreased from 18 to 2. During the last

three days the cylinder remained static. After 6½ days the manure turned white owing to the development of actinomycetes.

It was then placed into boxes, mushroom spawn added, incubated under the usual conditions at about 22°, and taken to grow in a quarry. The crop amounted to 68 kg. per sq. m. or 240 kg. per ton dry manure in otherwise unfavourable conditions, the quarry being cold and exceedingly damp. In all the experiments the pH was between 8 and 8·5.

CORTIN (B.). **Den svenska svamplitteraturen. En orientering.** [Swedish Mushroom literature. An orientation.]—*Skogen*, 42, 1, pp. 18–19, 1955.

This is a review of some outstanding contributions to the Swedish literature on edible fungi from the first publication by Fries on the subject (1836) up to the present day.

SIMONS (J. N.). **Some plant-vector-virus relationships of southern Cucumber mosaic virus.**—*Phytopathology*, 45, 4, pp. 217–219, 2 graphs, 1955.

Of recent years southern cucumber (southern celery) mosaic virus [strain of cucumber mosaic virus], formerly responsible for a severe disease of celery and [chilli] pepper in south Florida [*R.A.M.*, 26, p. 148], has been almost innocuous to the former host but still causes occasional economic damage to the latter. In tests at the Everglades Experiment Station the virus, originating on *Commelina* sp. and maintained on tobacco, was transmitted by the cotton aphid (*Aphis gossypii*) [13, p. 416], the green peach aphid (*Myzus persicae*), and the bean aphid (*A. rumicis*) [*A. fabae*], listed in order of efficiency. The acquisition threshold for *A. gossypii* and *M. persicae* ranged from five to ten seconds.

As compared with Swiss chard (*Beta vulgaris* var. *cicla*), California Wonder chilli (*Capsicum frutescens*) proved to be a superior host for rearing aphids and a more susceptible test plant, whereas the former species appeared to be a better source of inoculum. The use of the least compatible combination—chard as aphid host and test plant and chilli as source of inoculum—resulted in a significantly lower level of transmission than did the converse –chilli as aphid host and test plant and chard as virus source. The results obtained with other combinations were intermediate.

The mean length of the initial, naturally terminated feeding time was 14·5 seconds, during which period a maximum number of vectors acquired the virus. The presence of an acquisition threshold period was indicated by a paucity of transmissions secured in feeding times of 10 to 12 seconds.

Spraying.—*Aust. dried Fruits News*, 28, 2, p. 9, 1950.

The following spray programme for the control of vine black spot [anthracnose: *Elsinoe ampelina*] in South Australia [*R.A.M.*, 34, p. 277] is recommended by the Nyah-Woorinen Enquiry Committee as a result of tests conducted at the Committee's research farm. If a winter treatment is considered desirable the vines may be sprayed with phenyl mercuric chloride (3 lb. per 100 gals.) at 'woolly bud'. At burst bud spraying is indispensable; an application of 1½ lb. thiram per 100 gals. water or of normal Bordeaux should be given when not more than 50 per cent. of the buds are showing green, followed by three more spring sprays at intervals of 14 days or less. After fruit set the bunches should be sprayed with 1½ lb. thiram. Any subsequent build-up of infection should be treated with 1½ lb. phenyl mercuric chloride, followed seven days later by 1½ lb. thiram.

At Merbein Research Station thiram, captan, and ziram gave about 50 per cent. more clean bunches at harvest than Bordeaux. The effectiveness of these newer fungicides against downy mildew [*Plasmopara viticola*: 29, p. 402], however, has not yet been finally determined; probably the best control is still given by Bordeaux.

Gollmick (F.). **Untersuchungen über die Blattbräune (Melanose) der Reben.** [Studies on the leaf browning (melanose) of Vines.]—*Phytopath. Z.*, 23, 3, pp. 249–322, 17 figs., 1955.

The principal results of an extensive study of vine melanose at the Institute for Phytopathology, Naumburg (Saale), Germany, may be summarized as follows. The form of the disorder under observation is designated 'false melanose' to distinguish it from the extraordinarily similar spotting associated with the 'true' or 'infectious' melanose caused by *Septoria ampelina* [*R.A.M.*, 32, p. 363]. False melanose falls into three types: (1) dot, spot, or surface; (2) pinnate stripe; and (3) friction (wind-chafing). Type (1) has already been described [loc. cit.]. In (2) the formation of the rather large, circular to more or less spiral, brown spots, evenly distributed between the main lateral veins, coincides with the development of the autumn colouring and produces a regular, characteristic, and attractive pattern. It is virtually confined to the older leaves and does not extend beyond half the height of the stem. Type (3) results from the continuous friction of the lamina of one leaf mostly by the tip of another in the movement of air currents. The spots thus induced are dark, mostly ill-defined, and are disposed in the form of bands, frequently arched.

Histological and cytological studies yielded no evidence for the implication of a parasitic agent in the etiology of false melanose, which appears to be favoured by any meteorological factors conducive to ripening of the stem wood. There seems to be no doubt that a predisposition to the disorder is genetically conditioned and that immune varieties may be developed by hybridization. The immediate cause of the trouble is considered to be acute potassium deficiency [31, p. 592] in the older leaves, from which this element is withdrawn with advancing maturity of the wood. It is assumed that the shortage leads to depletion of the assimilatory tissues in the foliage, which in turn produces cellular necrotization through photo-oxidative destruction of the chlorophyll.

Boubals (D.) & Vergnes (A.). **Essais de fongicides organiques dans la lutte contre le mildiou de la Vigne effectués en 1953.** [Tests with organic fungicides in the control of Vine mildew carried out in 1953.]—*Progr. agric. vitic.*, 141, 20–21, pp. 306–309; 22, pp. 330–335; 142, 27–28, pp. 6–12, 1954.

In a further test carried out near Montpellier, France, in 1953, 14-year-old Aramon vines grafted on Rupestris du Lot were sprayed against downy mildew [*Plasmopara viticola*: *R.A.M.*, 33, p. 277 and next abstract] with 2 per cent. Bordeaux mixture (controls) and products S (containing 50 per cent. captan) and D (65 per cent. zineb) [loc. cit.] on 19th June at 1,050 l. per ha. and on 24th June and 8th July at 1,150 l. Product S was applied at rates ranging from 0·25 to 1 kg. of the commercial product per 100 l. of water, and product D at 0·3 to 1·2 kg. Each S or D plot was then divided into three subplots and on 3rd August one was given a further treatment with the same product and at the same dosage as before, a second 2 per cent. Bordeaux, and a third remained untreated. The Bordeaux plot was similarly subdivided, two subplots being given further Bordeaux and the third remaining untreated.

During September and October, severe outbreaks of mildew occurred. On 4th November the plot treated throughout with Bordeaux showed only a few traces of mildew. In the plot treated with product S the vines given S on 3rd August, and those untreated, had lost their foliage, while the Bordeaux-treated subplot had retained most of it. In the plot treated with D the results were somewhat similar, except that those given the highest dosage of D throughout (including 3rd August) were as well protected as the Bordeaux controls.

It is concluded that the persistence of the fungicidal effect of S and D is inadequate, but that of D is proportional to concentration. If either material is used

against *P. viticola*, at whatever concentration, the final treatment at least (usually made during the first half of August) should always be made with 2 per cent. Bordeaux. In an average vineyard in the south of France, about 1,000 l. per ha. of 2 per cent. Bordeaux is recommended.

[This paper also appears (with a resumé) in *Ann. Inst. Rech. agron.*, Sér C (*Ann. Épiphyt.*), 5, 2, pp. 161–176, 1954.]

Boubals (D.), Vergnes (A.), & Bobo (H.). **Essais de fongicides organiques dans la lutte contre le mildiou de la Vigne effectués en 1954.** [Tests with organic fungicides in the control of Vine mildew carried out in 1954.]—*Progr. agric. vitic.*, **143**, 5, pp. 64–74, 1955.

In further comparative spraying tests against vine downy mildew [*Plasmopara viticola*: see preceding abstract], carried out during 1954 at the National School of Agriculture, Montpellier, France, Aramon vines grafted on 31 R and given eight applications from 13th May to 4th August of 2 per cent. Bordeaux, product S (0·5 per cent.), D (0·6 per cent.), a mixture containing 37·5 per cent. micronized copper oxychloride and 15 per cent. zineb used at 0·4 per cent. (treatment P_1), one containing the same materials at 12·5 and 45 per cent. used at 0·3 per cent. (P_2), and another containing 27 per cent. copper carbonate and 13 per cent. zineb used at 0·5 per cent. (M), developed, respectively, 16·42, 3·32, 9·45, 12·1, 23·55, and 10·15 per cent. infection of the fruit clusters (average of four blocks of vines) on 12th July. Captan (S) was thus significantly superior to the other products in the protection it afforded to the fruit, while zineb (D) and treatment M were better than Bordeaux.

Some plots became severely affected by *Oidium* [*Uncinula necator*: **33**, p. 701]. On 11th August vines given the six treatments had developed, respectively, 30, 32·5, 77·5, 10, 20, and 17·5 per cent. (average of four blocks) very severe infection. Thus, zineb gave significantly less control of *U. necator* than any of the other materials used. This defect is regarded as very serious, because if the autumn had been rainy *Botrytis cinerea* would probably have entered the lesions in the berries caused by *U. necator* and set up a general rotting of the crop.

Auret (M.). **Les poudrages contre le mildiou.** [Dust applications against mildew.] —*Fruits Prim. Afr. N.*, **24**, 256, pp. 245–246, 1954.

Discussing the advantages of applying copper dusts to vines for the control of downy mildew [*Plasmopara viticola*: *R.A.M.*, **6**, p. 653; **7**, pp. 615, 697], the author states that such a dust should be non-phytotoxic and should liberate an adequate amount of soluble copper in the presence of rain and dew; a copper content of 12·5 per cent. appears satisfactory. Dusting protects the healthy berries in an affected bunch, and should be carried out whatever the climatic conditions, especially just before and during flowering, preferably while dew is present or after rain.

Köhler (E.). **Beitrag zum Prämunitätsproblem. Studien am Tabakmosaik.** [Contribution to the premunity problem. Studies on Tobacco mosaic.]— *Phytopath. Z.*, **23**, 3, pp. 323–327, 2 figs., 1955.

Experience has shown that the results of the widely used cross-immunity or premunity test may easily be misinterpreted, and the studies herein reported from the Institute for Agricultural Virus Research, Brunswick, Germany, were aimed at the discovery of sources of error leading to false conclusions. Following the inoculation of White Burley tobacco plants at an early stage with tobacco mosaic virus, the young axial leaves often develop a particularly definite mosaic pattern, with sharply alternating dark and light green areas, in contrast to the much more diffuse or even non-existent spotting of the older foliage. Superinoculation of the mosaic leaves with para-tobacco mosaic virus [*R.A.M.*, **32**, p. 151] results in the

formation of the characteristic necrotic lesions exclusively on the dark green zones, the pale ones having evidently been premunized.

Concepts of the mechanism of premunity would suggest that those areas reacting positively to super-inoculation contain no virus, and the following data corroborate this hypothesis. A comparison of the expressed saps of the pale and dark zones (without veins) revealed a substantially lower concentration in the latter than in the former (ratio of 39·2 to 100). It is postulated that the flow of tobacco mosaic virus into the dark areas is impeded by the occlusion in an early phase of infection of the plasmodesmata leading to them. To this absence of premunity is attributable the possibility of superinfection. Further confirmation was afforded by microscopic examination, which disclosed an abundance of tobacco mosaic virus particles in almost every cell of the pale zones on both leaf surfaces and a virtually complete lack of them in the dark portions. It would appear, therefore, that the latter can be invaded by the second virus because of the absence of the first in the epidermis and presumably also in the assimilation tissue. The tobacco mosaic virus seems to be localized in the spongy and the finely branched vascular parenchyma, whence it is unable to prevent the superinfection by para-tobacco mosaic virus of the free areas.

The breakdown of premunity in the foregoing case is obviously the consequence of a permanently incomplete virus permeation of the leaf. An analogous example is provided by the following experiment. When *Datura stramonium* leaves inoculated with a weak strain of potato virus X, e.g., RE5, isolated from the red-skinned variant of Duke of York [cf. 29, p. 274], develop the early veinbanding symptom and are then superinoculated with a necrotizing strain of the same virus, necrotic spots are formed on the existing dark green veinbanding pattern and its outermost ramifications. Under ultra-violet light the area surrounding these zones of infection emits a blue fluorescence, pointing to the intensified production of scopoletin [cf. 28, p. 199].

It is inferred from these observations that the success or failure of premunization depends less on the total concentration reached by the first virus than on the manner of its distribution in the leaf. Even strains which attain only a low total concentration may confer protection against superinfection provided they penetrate the epidermis completely, while conversely a high total concentration is not necessarily decisive in the presence of virus-free areas in or under the epidermis.

Gray (R. A.). **Activity of an antiviral agent from Nocardia on two viruses in intact plants.**—*Phytopathology*, 45, 5, pp. 281–285, 1955.

At the Research Laboratories, Chemical Division, Merck & Co., Inc., Rahway, New Jersey, leaf spray applications of 1,000 p.p.m. semi-purified noformicin, an antibiotic produced by *Nocardia formica*, isolated from an abandoned African ants' nest in an imported mahogany log, markedly inhibited both local lesion development and systemic infection by southern bean mosaic virus in Idaho, Pinto, Stringless Green Refugee, and Bountiful beans [*Phaseolus vulgaris*] and by tobacco mosaic in *Nicotiana rustica* and White Burley tobacco [cf. *R.A.M.*, 34, p. 187]. Equally good results were obtained with sprays containing 125 p.p.m. crystalline noformicin. The activity of the new antibiotic against the two viruses was similar to but less lasting than that of thiouracil [32, p. 515], used as a standard of comparison. Applied at the rate of 1,000 p.p.m. to the roots of Pinto bean plants growing in sand, noformicin reduced the number of local lesions developing in the primary leaves by 77 per cent. Neither virus, however, was inactivated by *in vitro* treatment with semi-purified noformicin at 1,000 p.p.m. or pure noformicin hydrochloride at 250 p.p.m. for 24 hours at 28° C. or for 81 at 6°.

Virus infections were equally well suppressed when noformicin sprays were applied to the foliage one hour or one day after inoculation or several days before-

hand. It was ascertained that the antibiotic was translocated from the base of a bean leaf to the tip and to a lesser extent in the reverse direction.

BROADBENT (L.). **The epidemiology of aphid-borne virus diseases.**—*Trans. int. Congr. Ent.*, 9, pp. 619–622, 1952. [Abs. in *Biol. Abstr.*, 28, 9, p. 2176, 1954.]

In virus epidemiology [cf. *R.A.M.*, 32, p. 144; 33, p. 550] the number of aphids present, their activity (as influenced by age and weather conditions), their enemies, the state of the crop, and the distances between infected and healthy plants must all be considered. Aphicides do not necessarily prevent the spread of aphid-transmitted viruses: they are more likely to limit spread within a crop than between crops.

GRANCINI (P.). **Le malattie delle colture ortensi.** [Diseases of market garden crops.]—Reprinted from *Riv. Ortoflorofruttic. ital.*, 38, 5–6, 11 pp., 4 figs., 1954. [English summary.]

The author discusses the increased incidence of diseases of market-garden crops in the suburbs of Milan, as a result of environmental conditions and cultural operations, notably beet yellows virus attacking garden beets, sugar beet, and spinach [*R.A.M.*, 33, p. 331], tomato mosaic [tobacco mosaic virus] and fern leaf [cucumber mosaic and tobacco mosaic viruses: 33, p. 388], bean [*Phaseolus vulgaris*] mosaic virus, and lettuce mosaic, and describes means of controlling them.

BALDACCI (E.). **Le malattie da virus nelle piante erbacee. Relazione sulle ricerche svolte intorno ad alcune malattie da virus negli anni 1950–1953.** [Virus diseases of herbaceous plants. Report of investigations on some virus diseases during the years 1950–1953.]—*Boll. Agric., Milano*, 2 (*1954*), 12 pp., 1954.

In this paper, read at a conference of the Agrarian Society of Lombardy in December, 1953, the author describes the variety of symptoms produced by viruses in the different parts of a plant [*R.A.M.*, 33, p. 582], methods for diagnosing the causal virus, and notes on work on specific virus diseases published in Italy from 1950 to 1953.

Pflanzenschutzbestimmungen im Ausland. Italien. Regelung der Ein- und Durchfuhr von Pflanzen und Pflanzenerzeugnissen. Ministerialverordnung vom 1. Juli 1954. [Foreign plant protection regulations. Italy. Control of the import and transit of plants and plant products. Ministerial Decree of 1st July, 1954.]—*Amtl. PflSchBestimm.*, N.F., 7, 4, pp. 185–190, 1955.

The following are among the provisions of the above-mentioned Decree, which was published in the *Gazzetta Ufficiale del Regno d'Italia*, No. 181, on 10th August, 1954. The importation and transit of fruit-bearing plants and parts thereof and fresh fruit of any kind from Argentina, Australia, Brazil, Chile, China, the Hawaiian Islands, India and Pakistan, Japan, Canada, Mexico, the Philippines, South Africa, and the United States is prohibited on account of various insect pests and the fungi *Plowrightia morbosa* [*Dibotryon morbosum*] and *Gloeosporium* [*Neofabraea*] *perennans*. Also forbidden is the importation and transit from all countries of plants and fruits of every kind of Solanaceae to avoid the risk of introducing various pests and [unspecified] virus diseases; of maize stems and cobs from all African countries, also against viroses; of almonds in the shell from all countries except Spain on account of *Ascochyta chlorospora* [*R.A.M.*, 11, p. 752], Spanish consignments to be accompanied by the necessary certificates; of Cactaceae from all countries to guard against the introduction of [unspecified] pests and diseases; of plants and seeds of *Castanea mollissima* and *Quercus* spp. (including wood of the latter unless treated by a preservative and moisture-repellent procedure) from the United States to exclude *Chalara quercina*.

Potato tubers may be imported on condition that they are free from soil and from infection by *Synchytrium endobioticum* and *Corynebacterium sepedonicum*, and that each consignment is accompanied by a certificate vouching for the absence of dangerous and transmissible diseases and pests.

Citrus fruits may be imported by way of Genoa, Naples, and Venice between 1st December and 31st May provided each fruit is wrapped in paper and packed in boxes, and all the year round (under the same conditions) from Spain, Israel, Lebanon, Cyprus, Egypt, and Turkey. All consignments must be accompanied by the usual health certificates. The importation and transit of citrus plants from all foreign countries are banned to prevent the introduction, *inter alia*, of *Pseudomonas* [*Xanthomonas*] *citri*, *Corticium salmonicolor*, *Gloeosporium limetticola*, '*Diplodia citri*', and tristeza [virus] disease.

Further prohibited are the importation and transit of all parts (except the seed-clusters) of red beet plants to obviate the introduction of [unspecified] viroses. Consignments of seed are permitted to enter under the usual guarantees.

Pseudotsuga plants from all foreign countries and those of *Abies*, *Picea*, *Pinus*, and *Tsuga* spp. from outside Europe may be imported only if certified free from dangerous diseases and pests, especially *Rhabdocline pseudotsugae*.

Pflanzenschutzbestimmungen im Ausland. Pakistan. Einfuhr von Pflanzen usw. Zustammenstellung der Bestimmungen. 1950. [Foreign plant protection regulations. Pakistan. Import of plants, etc. Summary of the regulations. 1950.]—*Amtl. PflSchBestimm.*, N.F., 7, 4, pp. 197–205, 1955.

The following are among the regulations promulgated in 1950 for the importation of plants into Pakistan. Except from Burma, potatoes may be imported by sea only if accompanied by a guarantee of freedom from wart disease (*Synchytrium endobioticum*) in the locality of cultivation and an official deposition to the effect that no case of infection has occurred during the 12 preceding months within a radius of five miles. Consignments from Italy may be admitted, however, if accompanied by a declaration of health from a Plant Protection Institute.

[*Hevea*] rubber plants and seeds entering Pakistan by the sea route must be furnished with a certificate of freedom from *Fomes lignosus*, *Sphaerostilbe repens*, *Dothidella ulei*, and *Oidium heveae*.

Citron, lemon, orange, grapefruit and other species of *Citrus* may be imported only if accompanied by an official deposition of freedom from *Deuterophoma tracheiphila*, which must also be absent from the country of origin.

Sugar-cane entering Pakistan by sea must be certified free from root diseases of all kinds, *Ceratostomella* [*Ceratocystis*] *paradoxa*, sereh disease, and gumming disease [*Xanthomonas vasculorum*], and guarantees are further required that it was produced by mosaic virus-free plants, and that Fiji disease does not occur in the country of origin.

Pflanzenschutzbestimmungen im Ausland. Tunesien. Liste der für die Kulturen gefährlichen Pflanzenkrankheiten und -schädlinge. Ergänzung der Verfügung vom 26. Juli 1932. Verfügung des Landwirtschaftsministers vom 20. November 1948. Verfügung des Landwirtschaftsministers vom 26. November 1953. [Foreign plant protection regulations. Tunisia. List of plant diseases and pests dangerous to cultivated crops. Amplification of the Decree of 26th July, 1932. Decree of the Ministry of Agriculture of 20th November, 1948. Decree of the Ministry of Agriculture of 26th November, 1953.]—*Amtl. PflSchBestimm.*, N.F., 7, 4, pp. 206–207, 1955.

The first of these decrees adds to the list of diseases dangerous to Tunisian cultivated crops [cf. *R.A.M.*, 12, p. 335] quick decline, tristeza, and graft incompatibility of citrus, and the second, bacterial ring rot of potato (*Corynebacterium sepedonicum*).

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